

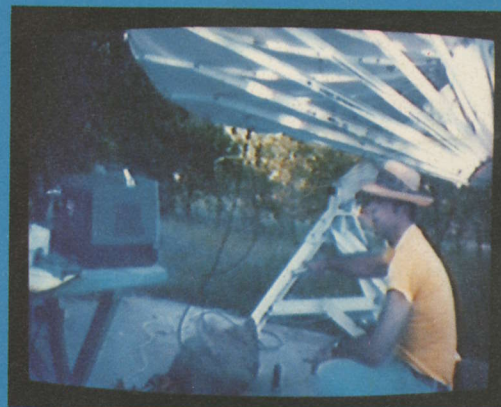
INSIDE THIS ISSUE

Red Photons On Our Heads
FROM RUSSIA WITH LOVE
Find The Bird
THE SATELLITE NAVIGATOR
Those 4 kHz Channels
THIS IS KFQD, ANCHORAGE
How Does It Work?
SAT — TEC RECEIVER REVIEW

COOP'S SATELLITE DIGEST



JULY 1980



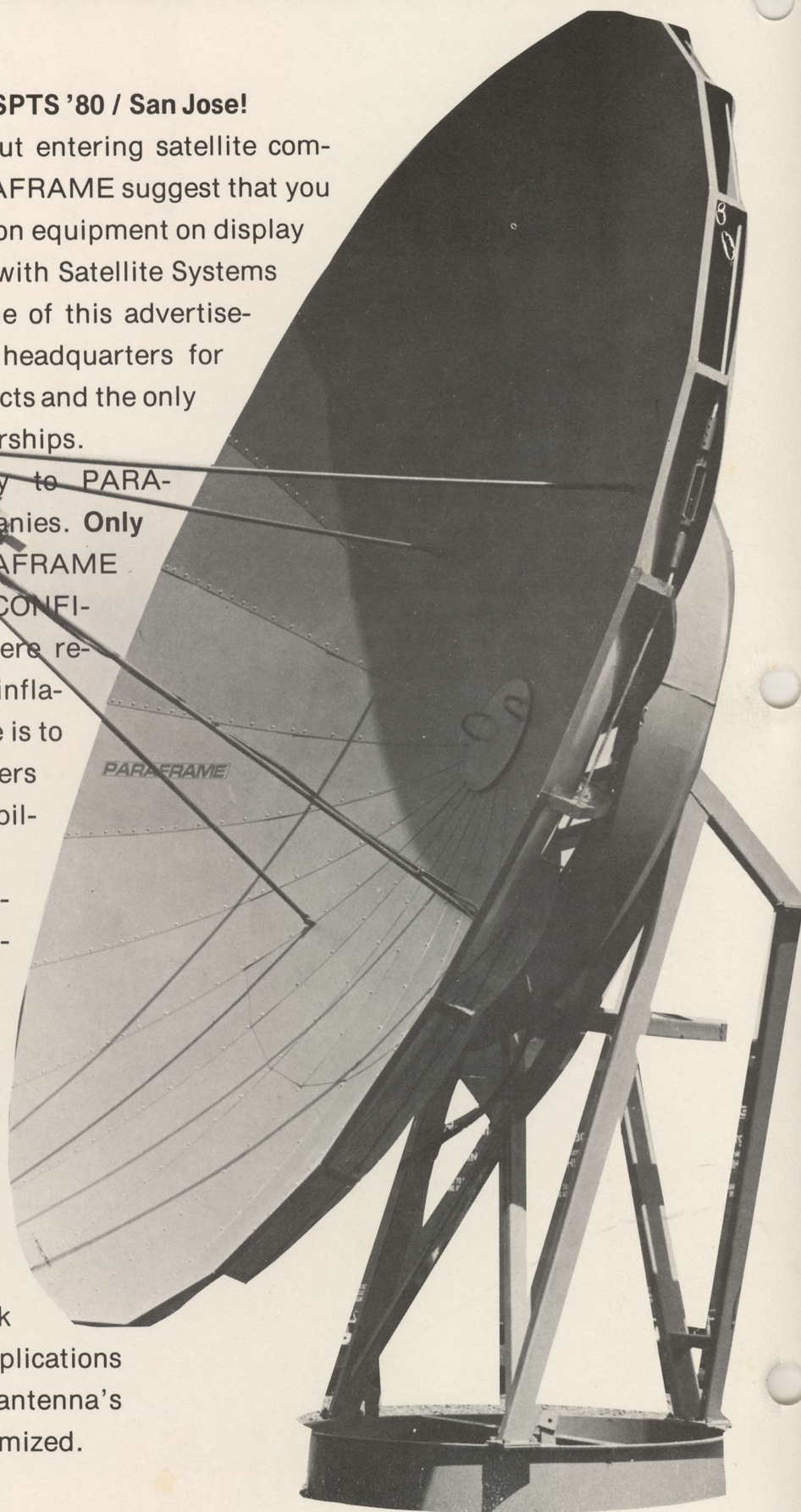
PARAFRAME

PARAFRAME, INC. welcomes you to SPTS '80 / San Jose!

If you are thinking seriously about entering satellite communications as a business, we at PARAFRAME suggest that you carefully examine all of the earth station equipment on display at SPTS. **Then** make an appointment with Satellite Systems of Illinois (address on right hand page of this advertisement) to visit PARAFRAME, INC.; headquarters for **professional-grade** earth station products and the only manufacturer offering protected dealerships.

PARAFRAME, INC. sells only to PARAFRAME dealers and/or CATV companies. **Only** PARAFRAME dealers can buy PARAFRAME products at dealer prices, which are **CONFIDENTIAL**. With the economy in severe recession (combined with outrageous inflation) we think the most prudent course is to build equipment of lasting value for users who understand that quality and durability are hedges against inflation.

PARAFRAME antennas are unique; they have an adjustable superstructure or **parabolic framework** which is now **patented**. PARAFRAME antennas are adjusted and 'proofed' **on site for maximum real world gain**. Our antennas are adjusted to conform to a parabolic proofing gauge known as the PARAFRAME Proofing template. The PARAFRAME Philosophy dates back to our early work with scientific applications (i.e. radio astronomy) where every antenna's performance must be known and maximized.



PARAFRAME



PARAFRAME antenna feature precision aiming mechanisms of silken-smooth, backlash-free operation. PARAFRAME aiming mechanisms are totally repeatable.

PARAFRAME antennas are presently manufactured in two sizes: 3.66 and 4.85 meters.

To learn more about PARAFRAME antennas and earth station products, and how to become a protected PARAFRAME dealer, contact:

Bob Christofanelli
Satellite Systems of Illinois
P. O. Box 68
Steger, Illinois 60475
Phone 312-755-5400

These companies have joined the PARAFRAME Family of Protected Dealers:

Mid-Continent Earth Stations
P. O. Box 81673
Lincoln, Nebraska 68501
Phone 402-476-2211

Tower Enterprises, Inc.
442A West Pike Street
Clarksburg, WV 26301
Phone 304-623-3238

Jerry Peake Company, Inc.
2328 Montgomery Street
Silver Spring, MD 20910
Phone 301-587-2515

PARAFRAME

PARAFRAME, INC. - Box 423
MONEE, ILLINOIS 60499

COOP'S COMMENT ON TECHNOLOGY

SOFTWARE INTERFACING

In anticipation of successful acquisition of the Russian Molniya satellite system STT had been looking around for some way to do high quality conversion of the Russian SECAM color standards to an (American) NTSC standards receiver as early as last fall. Then we ran across a Sony Video Products handbook which listed on page 41 just what we were looking for. In fact, we passed this information along to readers of CSD in our March 1980 issue (page P13) when we noted:

"...the various video standards in use in the world today are at best confusing to those of us brought up on NTSC color. Sony markets a standards-switchable monitor (PVM-1850PS) which allows you to switch between PAL/SECAM/NTSC. That's one approach to being able to resolve (in color) anything the birds throw down to you."

For the record, we ordered such a machine and we relied upon the Sony Video Products handbook being accurate when we ordered this monitor. We reproduce without fear of copyright violation the applicable segment of that handbook here.

PVM-1850PS Trinitron® Color Monitor

- Exclusive Trinitron one gun/one lens color system provides superb color in an unusually compact, lightweight unit
- Reproduces video and audio from NTSC, PAL and SECAM signals
- Video and audio IN/OUT connections for loop-through systems

When we first acquired the Russian signals we tried the monitor out; it had been in a box after arriving, without check-out, since we have no real need for another NTSC monitor these days. We should have been suspicious of Sony's claim I guess, even their 'lightweight' claim in their text falls apart when you lift the nearly 72 pounds off the ground!

Well, the monitor didn't resolve Russian color. In fact, it didn't resolve Russia at all. Further checks revealed it would not resolve the Brazilian PAL signals. In desperation we tried it on NTSC color and found only black and white. At this point we went back to our Sony dealer in Oklahoma City (Industrial Video, Inc.). They wanted to return it to Sony for repair but we thought perhaps that would be a waste of time unless we first determined what it was the monitor was really supposed to do. After some frustration trying to find someone (anyone) at Sony that even knew there was such a product in the line, we arrived at the truth. On the chance that you are considering purchasing a Sony monitor that resolves PAL/SECAM/NTSC color video we pass along the following to you as a warning.

The Sony PVM-1850PS is not for you. As far as I know, there is no monitor built in the world today that will (as a monitor) allow you to switch between the various PAL/SECAM/NTSC standards. Russian SECAM is a 625 line / 8 MHz bandwidth (6 MHz video with audio 6.5 MHz higher) / negative modulation of video / FM audio system. The French, who invented SECAM, use two standards; their 819 line format is 14 MHz bandwidth / 10 MHz video with the audio + / - 11.15 MHz (video is FM) and their audio is AM (!). Their more common European PAL approach is 625 lines / 6 MHz bandwidth (video is 4.2 MHz wide) / audio is 4.5 MHz higher / video modulation is positive and the audio is still AM. The United Kingdom PAL format is 625 line / 8 MHz bandwidth (video is 5.5 MHz wide) / audio is 6 MHz higher, video is negative and the audio is FM. The Brazilian PAL format is 525 line / 6 MHz bandwidth (video is 4.2 MHz wide) / audio is 4.5 MHz higher FM and the picture is negatively modulated.

There are 14 different standards in the world. A real switchable standards monitor would need 14 different switch-selected sets of video processing.

The PVM-1850PS does none of this. Which SECAM system it works on I can't say. Which PAL system it works on I also cannot say. NTSC? Well, it turns out Sony has something unique to Sony; a 'modified' NTSC format which only slaves to a special VO-2630 PAL/SECAM/NTSC 3/4 inch deck system. "This (modified) NTSC system" unique to Sony might be considered the world's "15th standard". Good grief.

My Sony dealer took back the PVM-1850PS and gave me full credit. But Sony refused to take it back from him. I think that stinks. Especially when Sony's latest 'handbook' slides a new world ("modified") into the all too brief text that extolls the virtues of the 1850PS.

provides superb color in an unusually compact, lightweight unit • Reproduces video and audio from modified NTSC, PAL and SECAM signals • Video and audio

Before I gave up on Sony I tried to find out if they manufacture monitors for export to the USSR thinking that would be one way to be sure of getting a Russian standards picture. Alas the Sony guy in Dallas told us we shouldn't be trying to receive a Russian signal "because it has 819 lines". Good grief again. In disgust I gave up on Sony in spite of the fact our full production and editing system is Sony and in that area I love 'em to death (i.e. we are very happy with their products). Be warned. Standards conversion is no piece of cake.

CSD
TECHNOLOGY



COOP'S SATELLITE DIGEST (Technology Section) is published monthly by Robert B. and Susan T. Cooper doing business as Satellite Television Technology (Ltd.), P. O. Box G, Arcadia, OK 73007 (USA); 405-396-2574. CSD is not affiliated with any satellite programming distributor, hardware (equipment) manufacturer or distributor nor satellite systems operator. STT sponsors the Satellite Private Terminal Seminars (SPTS) held three times per year and does produce and distribute 'learning' materials and 'how-to-do-it' manuals relating to the development of the low-cost satellite TV receiving system industry. Subscription fee is \$50 (US funds) in advance Canada, US, Mexico; \$75 (US funds) elsewhere. Copyright 1980 by Robert B. and Susan T. Cooper.

ACCURATE BIRD TRACKING WITH THE SATELLITE NAVIGATOR

BONUS...PREDICTING SUN TRANSIT OUTAGE!

Perhaps you know by now from the literature that the sun gets **directly behind** each satellite about twice a year. The weak transmitter power of the satellite is no match for the sun and your receiver, to use a TV phrase, **takes black!** The signal will disappear for a period of time (dependent on many factors but mostly due to the beamwidth of your antenna). If you run a TV station or a Cable system, then solar outage can be better tolerated if you at least know when to expect it. To anyone else, it's good to know when your system may start to act up.

It's hard to know precisely when solar outages will happen unless you are an astronomer or know something about marine navigation tools. But wait! The sun will have the azimuth and elevation as the satellite at the time of an outage. Aha! If we know when the sun will have the same coordinates as the satellite, we can predict the exact moment of the outage.

All you need to do is scan the **STT Sun Shot Chart** for your latitude and note the time when the sun has about the same azimuth and elevation as the satellite. Easy isn't it?

FINE TUNING TECHNIQUES REVEALED

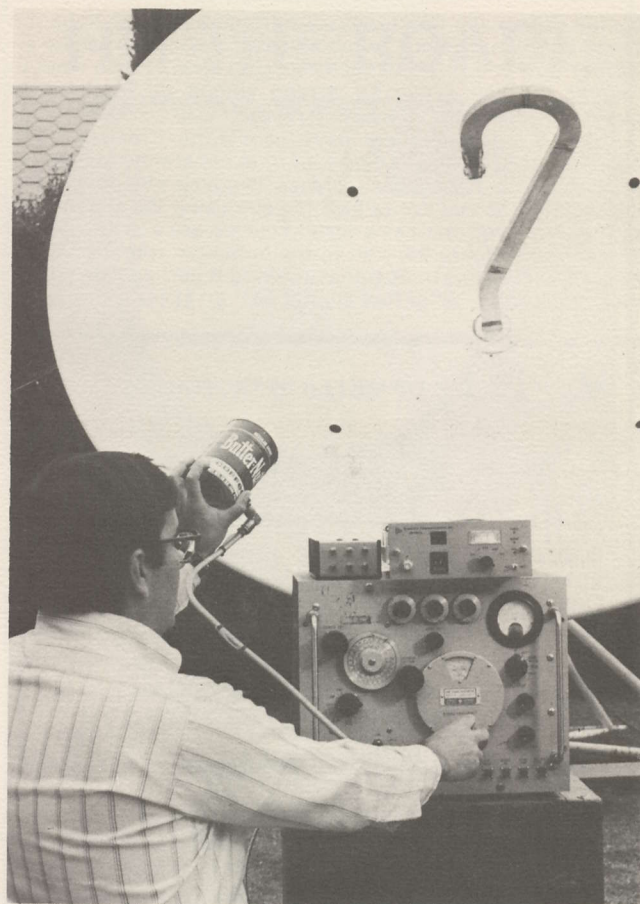
At this point, if your equipment is working properly and you are tuned to a working transponder, you should see some kind of a picture. I say 'should' because other variables are involved such as 'sun outage'. Of course you can verify that by simply looking at the shadow cast by your LNA feed point. Other problems you might have are that you may be tuned to a vertically polarized transponder while your antenna feed is horizontally polarized. The test for that possibility is simple enough, but you must remember to test one thing at a time. Too often you can fool yourself by changing parts or making more than two adjustments at a time. **This is clearly a no-no** because you can unknowingly cause something to stop working which now puts you in the very unhandy position of having more than one variable to control to get a picture.

Let's say you **know** the equipment is working and you

ABOUT THIS REPORT -

At SPTS '80 in San Jose STT is releasing a trio of new manuals. One, authored by Stephen Gibson of Los Angeles, offers the satellite student the first complete textbook on satellite antenna mounting systems, 'navigation' [the art of finding satellites quickly] and automated dish control systems. From that new STT manual we present this 'extract' because we think Gibson's experience, knowledge and tips in the antenna mount area deserve the widest possible distribution.

By
Stephen Gibson
Gibson Engineering
547 North Beachwood Drive
Los Angeles, CA 90004



SURPLUS model 916AL generator and a coffee can antenna makes a dandy satellite simulator.

know the dish is aimed as best as the accuracy of our simple instruments will permit. What then? Remembering that we must change only one thing at a time, we can gently sweep the dish a few degrees left and right of what we believe is the proper azimuth angle. Small adjustments are safer and while it will be very hard to contain your excitement, it is known from the experience of scores of antenna installers that you must go slowly to achieve rapid success.

If you still haven't received a picture, then you must restore the antenna to your best estimate of the azimuth angle and begin to adjust the elevation angle in small increments. **One adjustment at a time is the key.**

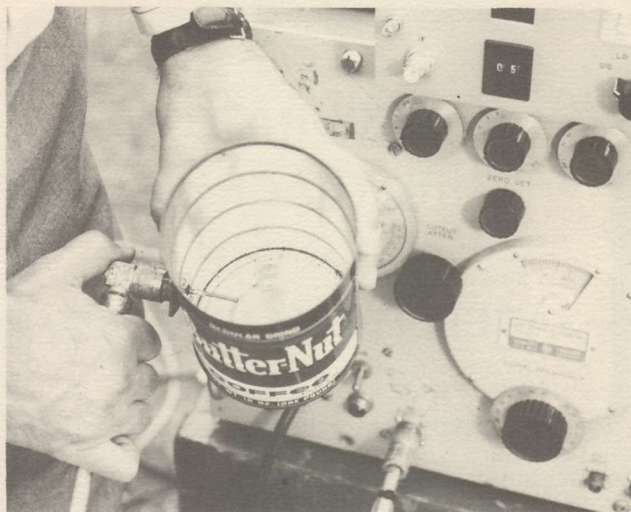
An alternative method is to **slightly** adjust the elevation and then re-sweep across the azimuth position. This practice is **repeated** for various elevation angles that are very near the calculated values. It is best to start at an elevation angle on one side of the predicted value and work your way through it each time gently sweeping the antenna a few degrees on both sides of the predicted azimuth values. You must be careful not to move the antenna in too large jumps in the elevation plane or you might miss the bird when you sweep the azimuth plane.

The measure of your ultimate success at this point will be totally up to your partner in this project...none other than Edsel Murphy. You may remember him as that fabled seer who said **'If anything can go wrong...it will'**. Ridding your TVRO of Edsel Murphy's influence is the bane of all satellite pioneers. If he has graced your station with a visit, then it's time to adopt stronger measures.

It's best to start over by first checking your equipment for proper tuning and cable connections. An easy way to test your entire antenna/LNA/receiver set-up is to simulate a satellite signal by connecting the output of a microwave signal generator to a small antenna and pointing it at your dish.

Coffee cans make dandy 'horn' antennas as seen here. The probe antenna is about 1 inch long and positioned on the end (center pin) of an 'N' connector located about 1 inch from the rear of the can. Your TV screen should **go black** as the generator falls within the lock-in range of your receiver.

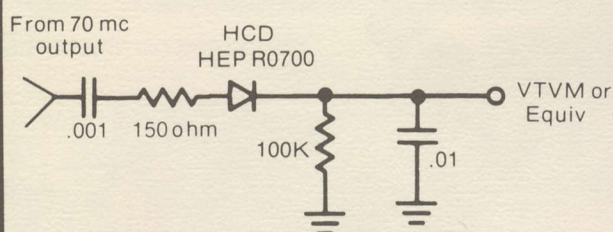
Perhaps an easier test instrument is the 'Freebee Photon Source'...the sun. Just swing your antenna around and point it at the sun. A noticeable increase in noise should be seen **immediately** as you swing past the sun using the shadow cast by the LNA/feed point as a sight. You can use a diode detector and a meter (**figure 24**) tied to the output of your 70 MHz IF strip as an effective indicator and calling it perhaps the world's most expensive 'amplified crystal set' or at least one of the



WHILE BUTTER-NUT can works very well, who knows the output you might get from a Folger's or Maxwell House can!!!

possible variables left and you know for sure you've aimed your antenna right, then and only then can you say that the satellite is either dead or that somebody must have shot it down!

TUNE-UP METER DETECTOR



(Part of world's most expensive crystal set.)

FIGURE 24

world's cheapest solar radio telescopes! Take your pick. The key idea here is to see some kind of change in the noise level because of the sun. The more the better.

THIS NONSENSE HAS GOT TO STOP!

With your equipment thoroughly checked, you can return to the antenna pointing angles. Recheck your calculations for the location of the bird. Crazy as it sounds you can get your own coordinates wrong and thereby cause your answers to be screwy. **Check the obvious.** Recalculate the position of the bird. Double check yourself by using the satellite pointing charts. An error of more than a few degrees should be suspect.

Next study your antenna. Is the LNA **really** at the focal point? An error of an inch or more can mean zero signal into your receiver despite the fact the dish is 'right on' the bird. Either check with the manufacturer or **calculate the focal point** from this simple formula...

$$\text{focal point} = \frac{(\text{diameter})^2}{16 \times \text{depth}}$$

Next recheck your elevation inclinometer. Is it resting on a surface that **really is 90 degrees** or tangent to the look angle of the dish? You can check it to within a degree or two by pointing your dish at the sun using the shadow method we described before and then seeing if the inclinometer agrees with the sun elevation angle for your location on this date from the **STT Sun Shot Charts**.

Lastly, recheck your azimuth angle. If you use the sun shooter method, then double check yourself with a compass. Just stand some distance away from the antenna with the compass oriented for true north (use the Generalized Magnetic Variation chart in **Appendix B**) and eye-ball the azimuth angle from you to the center line of the dish.

If you've checked your equipment and aligned your dish and still don't have a signal, it's a good idea to shoot for another satellite because you will more often than not discover your error while going through the routine again. The secret to antenna pointing is to reduce the number of variables. When you arrive at simple azimuth and elevation angles as the only

GETTING THE TIP OF THE PEAK

Once you've had that magic moment when your first picture climbs out of the sparklies you may almost immediately want to improve it. Rocking the antenna back and forth or up and down while looking at the picture works rather well. It works even better if you tune the receiver to the **weakest transponder** (the one with the **most** sparklies) and make your antenna fine adjustments.

An even better method for purists or those with marginal size antennas is to get a meter on the receiver. A simple method to use if you don't have a meter is to connect a shortwave radio that has an 'S' meter on it to the video output of your receiver and tune the radio to a data carrier on one of the many data transponders (tune 0 kHz to 4 MHz). Some receivers have filters ahead of the video output to effectively screen out the sound carriers above 5.5 MHz. It is not too difficult to simply open up the receiver with the diagram in hand and tap-into the circuit just ahead of the video lowpass filter. In fact a new connector installed on the back of your receiver and a line running from it to this tap-into point is a worthy addition so that you can do some FM music or data subcarrier hunting at a later time.

Okay, you've connected the radio and discovered you can almost understand FM sound on an AM receiver if you tune it right. **Instead**, tune for an **unmodulated carrier** rather than FM (there are hundreds between 500 kHz and 3 to 4 MHz on non-video transponders). Now look at the 'S' meter on the radio. That's your indicator. If it's 'pegged' at the top, you must turn down the shortwave receiver RF gain or install a resistive pad to cut the signal into the receiver to the point that you get a convenient reading. Sometimes when Edsel Murphy is not around you can discover that the nifty video carrier lowpass filter the manufacturer installed is just enough pad to attenuate the signal and you simply connect the receiver to the video output!

Now it is a simple matter to rock the antenna and watch the 'S' meter as an indicator. If you don't have a shortwave receiver but still want a meter, then build the super simple crystal set in figure 24 and tie it to the 70 MHz IF output. If you tie the crystal set to 741 IC opamp wired as a DC amp, you can run a line out to your antenna as an outboard 'S' meter and see first hand what happens when you change position.

BUILDING THE MOTORIZED MOUNT

A lazy Sunday of satellite hopping has either got to be a symbol of weirdness in the 80's or the absolute proof that

you've got what it takes to reach for and attain the benefits from what many think is a wild odyssey. Just imagine yourself with more than 68 channels at your fingertips. Push a button and your antenna moves from satellite to satellite, as though it were hopping from universe to universe. 68 channels and



A SHORTWAVE RECEIVER makes a dandy tuning meter. The receiver allows tuning in transponder carriers and monitoring them with the 'S' meter long before they are strong enough to register on TVRO receiver meter [below].

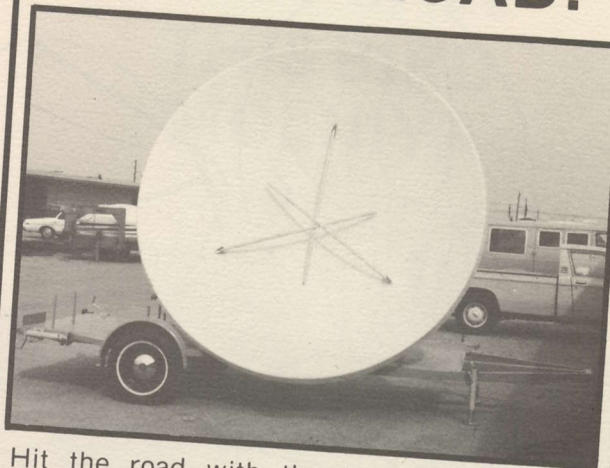
growing! And that's just the pictures. By now you know that there is more than just pictures up there. Wait till you hear the stereo music! And how about tying into that 'great database in the sky'? But we digress. So let's swing back on track and figure a cheap way to realize that lazy Sunday of satellite hopping.

Hanging a motor or two on a mount is really a custom job, but we can still suggest a few techniques that may steer you (no pun) in the right direction to quick, success. Keep in mind now that you don't have to know how an LNA works or any other technical stuff to motorize your mount. It's about as easy as installing an electrical socket if you can get a strong enough motor and some sturdy hardware to mount it. Levers, gears and chain drive connection arrangements are a piece of cake once you know how they work. We'll touch on the details as we go.

If you've installed a polar mount and only intend to reach a few satellites, then you may only need a single motor which you would mount on the single turning axis. You may choose to use a manual 'trailer jack' to adjust the declination in as much as you may not need to reach all the satellites in view at a time. On the other hand, two motors will give you worthwhile unlimited control. The AZ/EL mount will require two motors. Believe it or not, installing two motors is not twice as hard as installing one as we shall soon see.

Before we get more into the hardware, this might be a good place to suggest a special case where you actually could use only **one motor** and hit every bird. First you build the 'Laundry Pole' mount and stick a motor on the base of the dish as seen in **figure 25**. The motor has a gear on it and enough electrical wire to let it run along a curved track around the base. The height of the track is adjustable so the elevation of each satellite can be precisely set. But the motor and the track do not necessarily have to be geared. You could use a wire or winch approach so the motor would pull the dish along the track. Of course the motor must be reversible so you can swing the antenna in either direction. Another variation would be to simply lock the bottom of the dish in the track with something as simple as a wheel from a child's wagon and then apply a chain drive motor to turn the entire base. This idea is pure speculation and needs some hard thinking before it can be made to work.

HIT THE ROAD!



Hit the road with the leader; H & R's STARVIEW System. Nearly 100 systems shipped since Miami's SPTS; our dealers and distributors are on the road TODAY demonstrating and selling private TVRO systems!

STARVIEW DEALER SPECIAL

Complete 10' trailer mounted transportable system with top-quality commercial equipment, including:

- 10 foot STARVIEW parabolic equipped with rotatable feedhorn system
- Avantek 120°K LNA
- Microdyne 24 channel Receiver
- 75' of hookup cable and connectors

With this system you can pull up to a demo site and be showing off pictures in 30 minutes time! **The price? \$7200!**

SUPER LNA SALE!

H & R lowers the boom on LNA pricing. Here is the price break through you have been waiting for...brand new, superb high quality AVANTEK 120 degree Kelvin low noise amplifiers with 50 dB gain and DC power block for feeding operating voltage through the cable...only \$795 from H & R! If you didn't make it to SPTS '80 San Jose to take advantage of this special low price, contact us directly. **PLUS** - H & R now has in stock the brand-new Robert Coleman model 3742 24 channel tuneable TVRO receiver with fantastic features never before found on a private terminal receiver. Don't buy a receiver until you learn all about this one!

HIT the road with the 'Hit-Of-The-Road'; a STARVIEW system from H&R. YES - a limited number of dealerships are still available!

HIT THE ROAD!

H & R Communications
STARVIEW SYSTEMS
Route 3, Box 103G
Pocahontas, Ark. 72455
(501-647-2001)

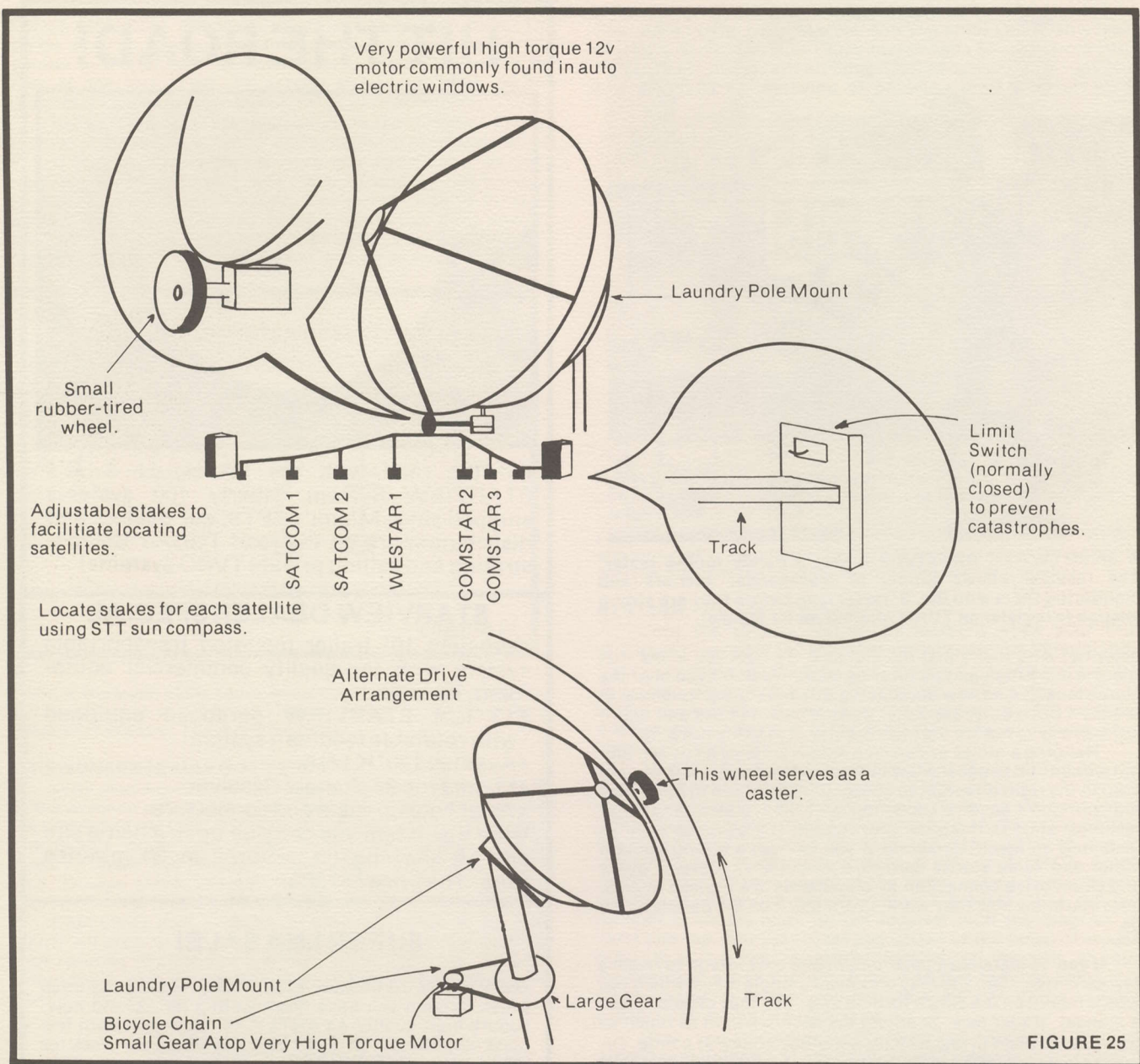


FIGURE 25

SLOW - TVRO System Delivery ?

ANXIOUS to get your earth station up and running? Tired of getting the run around on receiver and LNA delivery? Check with AVCOM!

AVCOM's field proven PSR-3 receiver is in full production. With remote tuning, dual video outputs, our exclusive Clamp-Sync and Scan-Tune, the PSR-3 is the finest TVRO receiver on the market. Combine this high-quality receiver with our in-house-stock of high quality 120°K (50 dB) LNAs and you have the best private terminal package available today. PLUS - we deliver radios and LNAs...not promises! YES - AVCOM always has room for one or two more qualified dealers and distributors.

AVCOM of Virginia, Inc. (804)320-4439
10139 Apache Road, Richmond, VA 23235

TVRO CABLE PACKAGES!

NOW available - special RG-217 low-loss cable assemblies with fittings installed and flexible pigtailed; ready to plug in and go! 217 cable is the ideal TVRO cable, low loss yet flexible. Our special connectors are ideal for quick connect-disconnect too!

#1180' 217 + 3 foot pigtail for LNA/rotation, all connectors. \$118 plus UPS.

#2140' 217 'extender' with quick connect barrel connector. \$59 plus UPS.

PLUS - the Cadillac of LNAs from AMPLICA! Each LNA has factory check-out data sheet showing **exact** specs (some LNAs intended for consumer use are 'bulk rated' so you are not sure what you are getting). You can purchase our 217 cable assemblies for 50% this month with each (single quantity) AMPLICA LNA purchased. Quantity pricing on LNAs and 217 cable assemblies available - inquire!

AVCOM of Virginia, Inc. (804)320-4439
10139 Apache Rd., Richmond, VA 23235

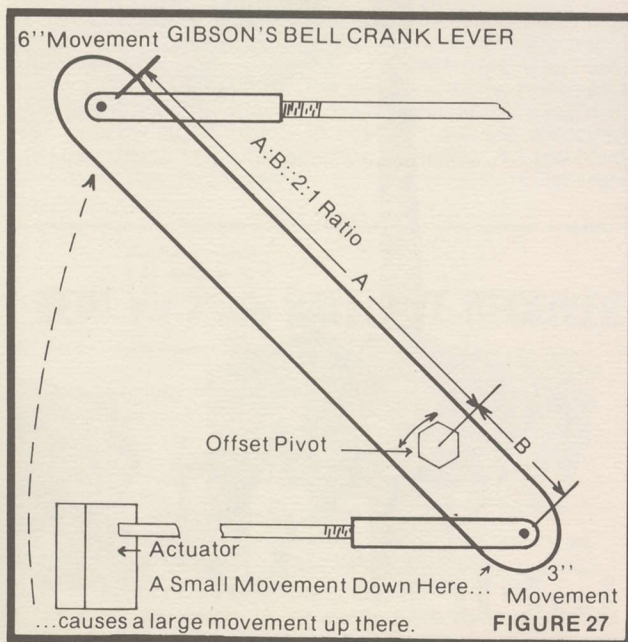
By the way, Swan antenna builders might find this track idea is just the ticket for mounting your feedpoint on a movable mount so you too can change satellites using only one LNA!

Another style of motor is the linear actuator. What's that? It's only a motorized shaft that moves in and out of a pipe. Dandy for moving dishes and cheap. A surplus linear actuator (Model 387OR) with a throw of nearly 6 inches runs about \$37.50 from Airborne Sales, 8501 Steller Dr., Culver City, California. Photos show you how a linear actuator can be applied to adjust azimuth as well as elevation in the fine tradition of Robert Coleman's inexpensive techniques.



SURPLUS linear actuator bolts right to the dish.

Suppose you need more of a throw than 6 inches? You can use simple levers you build from parts found at the hardware store or the junk yard. Looking at the diagram in figure 27, you can double the throw of any moving rod by connecting it to this simple lever arrangement, sometimes called a bell crank. The distance lever 'B' moves (your cheapy actuator) is doubled



THEY CALL THIS BIRD MOLNIYA



A whole family of Russian satellites circling over North America and beaming live Russian television back into the USSR. Now because STT has researched the Molniya reception challenge and developed hardware modifications and software systems to produce high quality Russian television throughout North America, you can share in the excitement of this ultimate satellite TV fantasy!

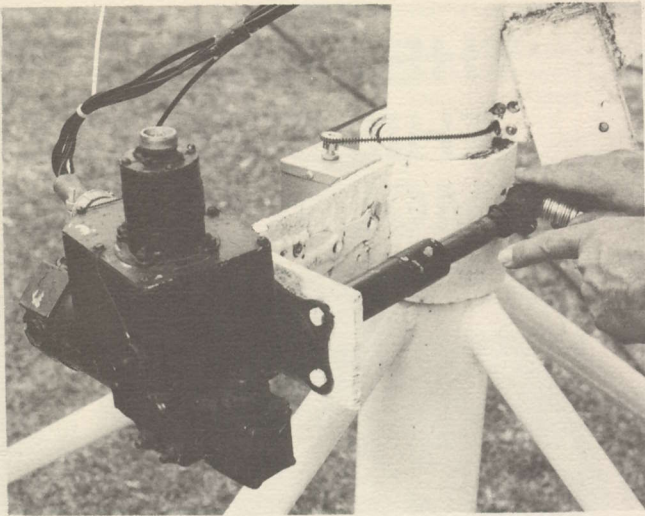
A very timely topic. Russian coverage of the 'Moscow Olympics' may well be the only 'live coverage' available in North America!

STT has rushed together a 2 hour color videotape in which Bob Cooper explains what the reception problems are, how you modify your equipment for Russian reception, how to find the Russian Molniya inclined orbit apogee in your northern sky.

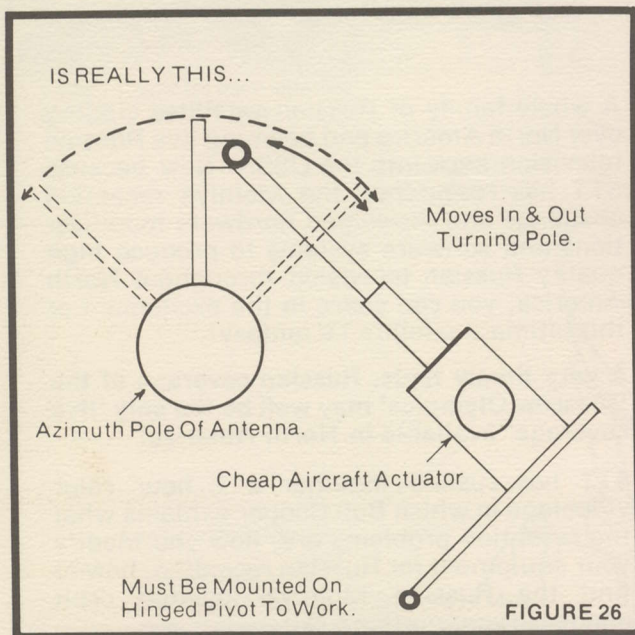
The two-hour 'They Call This Bird Molniya' STT videotape follows the construction of an 11 foot (ADM) antenna terminal, through the pain and agony of days of searching before the first Molniya was found, and ends up with the successful completion of the project and challenge. It tells the complete story, as it happened, including the excitement of the first actual reception.

STT videotape THS-1 is available for immediate shipment. Specify VHS or BETA format. Price \$60 postage paid US and Canada; \$65 (US funds) outside of US Canada.

STT P. O. Box G, Arcadia, OK 73007 405/396-2574



ACTUATOR BOLTS to a hinge mounted on the azimuth pole. Adjusting the distance from the center of the pole controls the number of degrees of rotation. NOTE: This.....



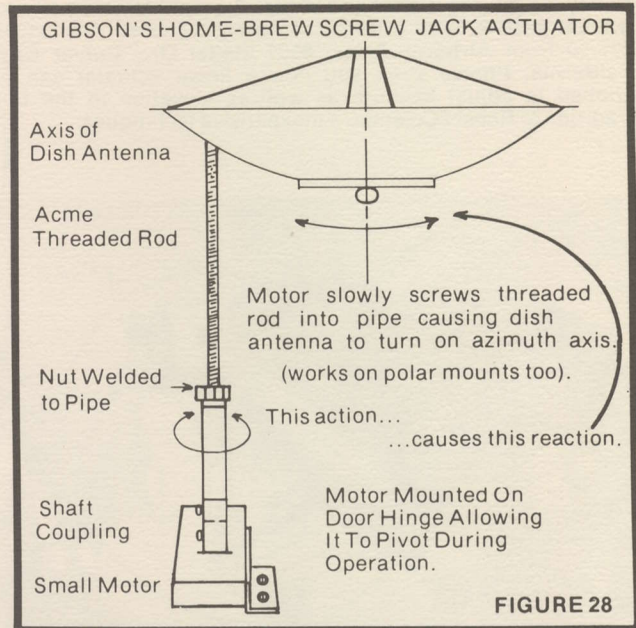
because lever 'A' (connected to your antenna) is twice as far from the turning point or fulcrum. Figuring the distances and dimensions is as easy as simple proportion arithmetic.

Another simple method of moving your antenna is to use a screw jack. You can build a unit like the one in **figure 28** by mounting a long pipe on the end of a motor that turns rather slowly (less than a few hundred RPM). A single nut is welded on the end of the pipe. Then a long threaded rod is screwed a few turns into the nut. The other end of the rod is connected to the dish. As the motor turns, so does the pipe which causes the threaded rod to be screwed deeper into the pipe and pulling your antenna around on it's axis.

You can find a good motor bargain from time to time in the catalog of **Herbach and Rademan Inc.**, 401 E. Erie Ave., Philadelphia, PA 19134, or the catalog from **C & H Sales**, 2176 E. Colorado Blvd., Pasadena, California 91107.

Both the motor and the rod must turn on their mounts. A large door hinge is a simple solution to this problem. Perhaps the key point here is to first understand what you want to do

and then look around for what is available to do it. A trip to a junk yard to just browse is what we mean. Rather than recommend specific components, it is better for you to see what's handy and use it.



SCREW JACK In use as a polar mount.

While a belt drive may seem attractive in as much as automobile fan belts are readily available, it's not a good idea because a stiff wind may cause your antenna to slip off the satellite. **We need solid rigidity.** Backlash or slop in the method you use to interface the motor could easily make you feel your antenna was back on that shakey saw horse! Doing it the easy way may not necessarily be the most satisfying later on. Still, one easy method to interface the motor is to use a simple bicycle chain drive. We must be careful here to watch for backlash or slop. **An adjustable mount** for the motor to remove slack in the chain is an absolute necessity.



HORIZONTAL screw jack used for azimuth axis.

The secret, if any, to making sprockets and chains work for you is to know something about ratios. When a small gear makes a turn, it causes a larger connecting gear to make less than a turn. The possible arrangements available to you are endless and you can calculate what you may need from simple formulas found in any complete gear catalog. One popular gear company is Boston Gear and you can obtain their thick catalog by writing **Boston Gear, 14 Hayward St., Quincy, Mass. 02171.** They have branch offices in other major cities which would be only too happy to supply you with more info on gears, chains and sprockets than you can digest in a week!

Installing a chain drive arrangement is a piece of cake. Bicycle chain is easy to find and a small sprocket slipped onto the shaft of your motor is all you really need. In fact, you can do it all with a single sprocket! The idea here is that you wrap the chain around the turning axis of the antenna and secure it as seen in **figure 29.** The motor moves the chain and the antenna will still turn, but only one sprocket is needed. All you have to do to make this neat trick work is to use care in the positioning of your motor.

NEW ICM TV-4200 SATELLITE RECEIVER

**Provides You
With These
Features
For \$1,995**



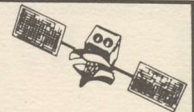
- Output levels compatible with video monitor or VTR input.
- Dual Audio Outputs 6.2 and 6.8 MHz. • Built in LNA power supply
- Tunable Satellite channels 3.7-4.2 GHz.

International Crystal Mfg. Co., Inc.
10 N. Lee Oklahoma City, Ok. 73102 405/236-3741



The

8-BALL



12-FOOT SPHERICAL

SATELLITE TELEVISION ANTENNA KIT

LIST PRICE: \$750.00



- Rugged steel frame
- Aluminum screen reflector surface
- Durable redwood strips support reflector screen
- Easy to assemble
- Easy to align
- Receive signals from several satellites
- Very low cost

VIDIARK ELECTRONICS DEVELOPMENT CO.

P. O. Box 57
Salem, Arkansas 72576
Phone: 501-895-3167

Alaska Microwave Labs

4335 E. 5TH STREET ANCHORAGE, ALASKA 99504
(907) 338-0340

TRANSISTORS

MRF901 FT4.5GHZ	\$3.25
BFR90 FT5.0GHZ	\$3.00
NEC 02137 FT4.5GHZ	\$3.25

HOT CARRIER DIODES

MBD101 UHF—MICROWAVE	\$1.50
ND4131 4GHZ NF—5.75 DB	\$13.25
4GHZ NF— 6.5 DB	\$2.00

CHIP CAPACITORS

10()47()100()1000() PF	\$.60
----------------------------	--------

RF - IF I.C. AMP

MWA-110 RF-IF AMPLIFIER I.C. 1 TO 400 MC 14 DB GAIN TYP 3 TERMINAL IN, OUT, & GROUND	\$ 7.95
---	---------

DUAL GATE MOSFET

RCA 40673	\$1.50
-----------	--------

COAX CONNECTORS

BNC CHASSIS MOUNT SQUARE FLANGE	\$1.87
BNC PLUG FOR RG-58	\$1.87
SMA CHASSIS MOUNT SQUARE FLANGE	\$5.90
SMA PLUG FOR RG-58	\$6.57
SMA PLUG FOR RG-174	\$6.57
TYPE N CHASSIS MOUNT SQUARE FLANGE	\$3.20
TYPE N PLUG FOR RG-9/RG-8	\$3.69

FEED-THRU CAPACITORS

500 PF	\$.50
--------	--------

TEFLON CIRCUIT BOARD

APPROX 3.5" x 5.0" x .010	\$5.50
APPROX 3.5" x 5.0" x .0312	\$6.50

CHIP RESISTORS

50 OHM WATT	\$1.50
-------------	--------

PISTON TRIMMERS

Triko 201-01M .5-3PF()1-8PF()	\$2.50
---------------------------------	--------

OPEN AT 8PM EST CLOSED 8PM PST



**ORDERS ARE POSTAGE PAID
COD-VISA-MASTERCARD**

**IF YOU DO NOT SEE
WHAT YOU WANT ASK**

EQUIPMENT REVIEW

CHAPARRAL'S NEW DISH FEED

AN EXTRA 0.5 dB?

Since the dawn of TVRO terminals, man has been looking for ways to improve the efficiency of his antenna system. Most terminal antenna designers talk in vague terms about the 'efficiency of the reflector surface' which leads the non-professional listener to assume there is something magical about the surface itself which has a direct bearing on how much signal the antenna develops. Of course there is one antenna-factor that does contribute to the 'efficiency' of the antenna; the precision with which the surface contour matches the parabolic curve selected for the design. But if you assume, with reasonable accuracy, that most antennas meet or exceed the nominal $\pm 1/8$ th inch tolerance over their surface areas, and such antennas still seem to perk along between 55 and 50% 'efficient', what other factor is involved in the antenna efficiency equation?

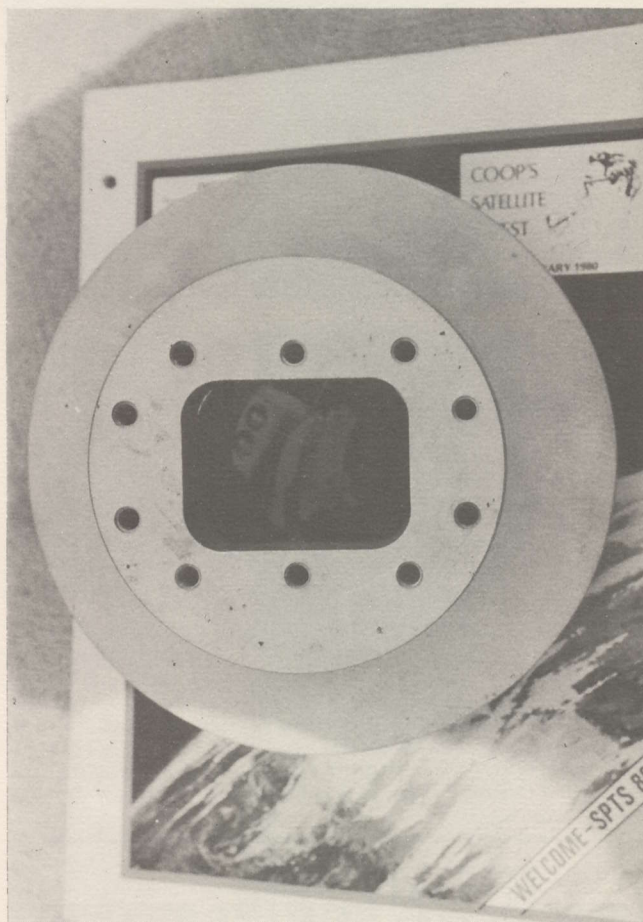
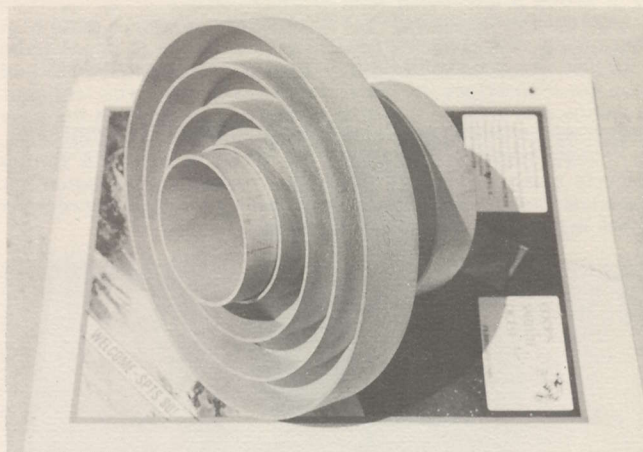
The answer of course is the feed antenna; that prime focus package that attaches typically directly to the LNA and into which energy intercepted by the reflector surface is 'funneled' to the LNA input probe.

When a designer says that a reflector surface has achieved "55% efficiency" he is really telling you that the **combination** of his reflector surface **plus** his chosen feed antenna is capturing, for the LNA, 55% of the satellite TV energy actually intercepted by the surface of the dish. In other words, an antenna that is 55% efficient is actually 45% inefficient! Or, 45% of the signal present on the reflector surface (however momentarily it is there) never finds its way into the LNA probe and your receiver.

Taylor Howard has been saying for more than a year that **"...the next quantum leap in antenna technology will be an improvement in antenna system efficiency; perhaps to as much as 80% efficiency"**. Teaming up with Bob Taggart of Chaparral Communications, Howard has set out to improve antenna efficiency by improving the design of the antenna feed system. This is a report on that feed innovation.

If you look closely at some of the commercial (as in CATV) feeds these days, you might notice they don't look like the now common-appearing 'horn antennas' which Howard describes in his Manual. In fact, they appear to be circular configurations similar in **some** respects to the Steve Birkill Scalar Horn launcher that sticks onto the front of the Birkill Hybrid Mode feed. Howard notes **"the empirical and mathematical literature on the scalar feed horn dates back to the early 60's with applications to many (radio) astronomy facilities and other high precision receiving installations"**. In other words, nobody has invented anything here; rather there is simply an act of adapting something already known in top drawer professional fields to the low-cost world of backyard TVRO terminals. And in the process picking up some precious parts of a dB of additional satellite carrier signal.

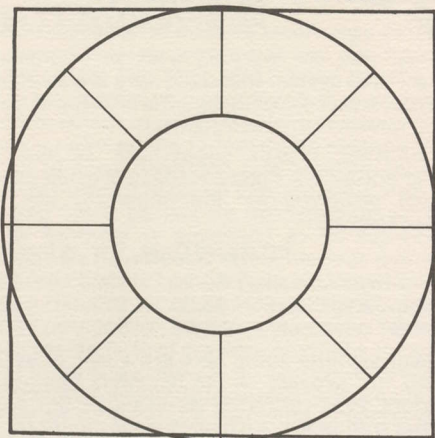
Readers are referenced to pages T11 and T12 for the April 1980 CSD where Tay Howard describes antenna range test measurements on his standard 'horn' antenna which is detailed in the 'Howard Terminal Manual'. Howard found the horn described in the manual to have an edge-of-dish



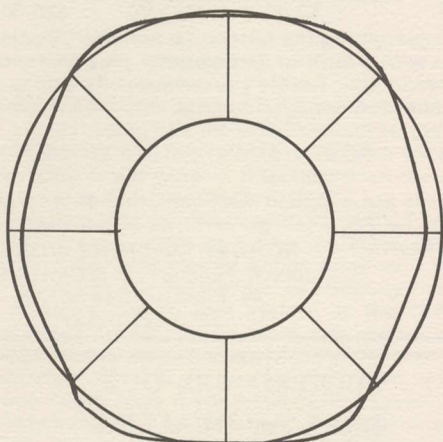
illumination that varied from -11.4 dB (for a dish with an f/D of .5) to -23 dB (for a dish with an f/D of .25). In the common .4 f/D area the Howard horn had an edge of dish illumination of -14.4 dB.

There are two primary factors relating to feedhorn design which have a direct bearing on the performance of the overall antenna 'efficiency'. The first is the edge of dish illumination, which is actually only a point on a chart that starts off with the spread of the illumination at the center of the dish and then tapers, lower and lower in terms of feedhorn antenna pattern, towards all edges of the dish. Tay Howard notes **"ideally one would like to have a feed horn pattern that was square across the top and dropped to zero right at the edge of the dish"**. One way to illustrate that is shown here. Receiver buffs will

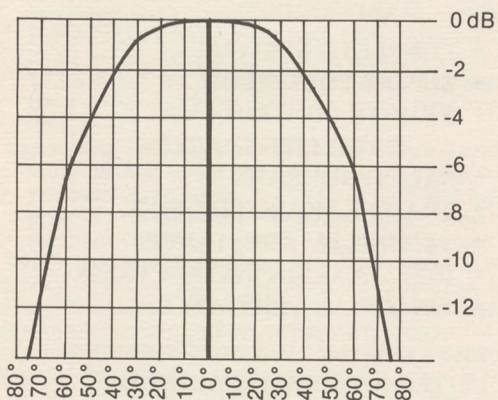
FEED HORN ILLUMINATION



"Idealized" Square Illumination

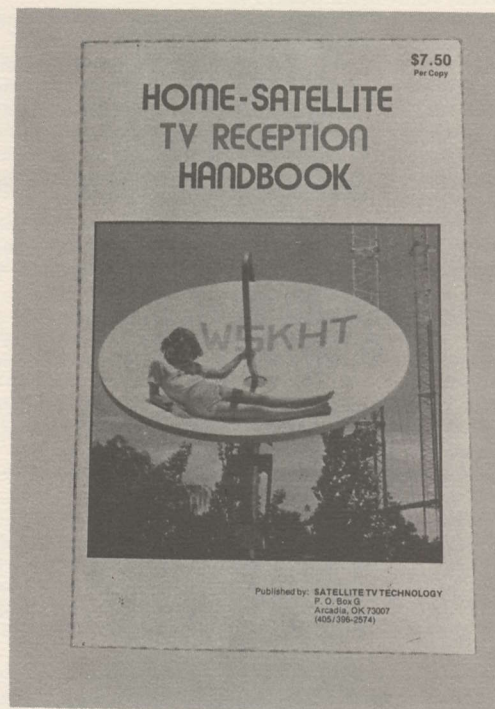


Near-Idealized 'Super-Feed'

Super-Feed Illumination as
A Function of Angle To Side

recognize the 'pattern' as an idealized IF bandpass curve representation or in essence a 'square wave'. Into this idealized pattern enters the real world where decades of parabolic testing has shown us that **maximum** (antenna system) **gain** occurs when the edges of the dish are illuminated at a level which is 10 dB 'down' (reference the illumination at the center of the dish, directly in front of the feed). But, that **minimum noise** (noise coming from the earth which sits behind

BRAND NEW for 1980!



The ONE book everyone cuts their teeth on; Bob Cooper's '**Home Satellite TV Reception Handbook**'. Now completely re-written and updated for 1980 including a new 16 page 'Sourcebook' section that lists hundreds of parts and equipment supplier sources! Anyone who was anyone in satellite TV, through mid-May of this year, is listed!

PLUS - completely new text on the latest equipment, latest transponder listings, international reception experiments and techniques. The complete primer that explains in lay terms what the satellite evolutionary revolution is all about, where it has been and where and how it is headed! If you are looking for a one stop source to help you explain how satellite TV (and audio services) work, what equipment is required and how much that equipment costs and where a person goes to get it, this 1980 version of the '**Home Satellite TV Reception Handbook**' is for you. Price is \$7.50 per copy in US, Canada and Mexico; \$10 elsewhere via first class mail. Convenient order card in this issue of CSD.

STT P. O. Box G, Arcadia, OK 73007 405/396-2574

and all around the dish) occurs when the edges of the dish are illuminated far lower than -10 dB. Tay notes "this is a matter for grim debate amongst the most precision minded users of parabolics, the radio astronomy crowd, and they typically reach a compromise where for their purposes the edge is illuminated down (or -) 20 dB".

In the case of the TVRO system where realistically one would shoot for a 'system noise temperature' in the 100 degree K(elvin) region, it can be shown on paper that the best C/N (carrier to noise ratio) occurs when the edges of the parabolic antenna are around 15 dB down (-).

When you have a more gradual taper in illumination, between the center of the dish or the so-called 'hot spot', and, the edges of the dish, you end up realizing more signal gain from the outer edges of the dish. BUT - in so doing you also have substantial earth-noise contribution picked up from the ground just beyond the edges of the dish (on all sides) and it is this noise, which then becomes added to the sky and equipment noise, which raises the overall noise 'level' (or system threshold).

The primary advantage to the standard horn described in 'The Howard Terminal Manual' is that the horn is cheap, not critical, and it works. It forgives slopping building techniques, up to a point.

But it is not optimized for maximum gain and least contribution of noise and this challenge sent Howard and Taggart back to the 20 year old texts originally created by the radio astronomy crowd. The result is the new feed antenna shown here. Howard calls it his E-MOD horn while Taggart likes to refer to the new device as the 'Super Feed'. Others might refer to the antenna feed as a 'Choke Plate Horn'. We suspect people will have their own versions in quick order and each will have a marketing name of its own!

The 'Super Feed' has a pattern as shown here; it is down 10 dB at the 65 degree points (0 degrees is straight in front of the feed at the center of the dish) and down 12 dB at 70 degrees. At .3 f/D the Super Feed is down 16.5 dB and at .4 f/D it is down 10.3 dB. The useful f/D range for this feed is .3 to .5 and that catches just about all of the popular dish designs. The 'efficiency' with this feed is close to 70%.

Now what does it do? Well, you will note that we have two separate devices here. One is a 'choke plate' (the fat, rectangular piece that ends up in a WR-229 flange) with a round tubular member attached. The choke plate is actually a quarter wave transformer designed to 'transform' or transition from the high efficiency round (tubular) feed member to the WR-229 flange. In other words, it gets you from 'round' to 'rectangular' without giving up a bunch of signal.

Attached to the very front of the tubular member is a scalar horn; that's the series of concentric circles hung on the front. Both the choke plate + tubular feed, and, the scalar horn are aluminum castings thanks to the clever hands of Bob Taggart. The whole system is capable of being mass produced and ultimately that affects the repetition from unit to unit as well as the ability to turn them out in volume.

The scalar horn is important; Tay Howard suggests that by having absolute concentric pattern on the front end of the feed the whole parabolic reflector surface is 'illuminated' (or 'seen') by the feed with identical precision. In the antenna world they talk of the 'E' (up and down or vertical) and 'H' (side to side or horizontal) planes of radiation or illumination. Since our parabolic reflector is round, it only has a top and bottom and left hand / right hand side because of our perspective; not because any part of the surface differs from any other part. However most feeds, in particular the common horn feed, try as they might to have exactly equal (i.e. the same) 'E' and 'H' plane illumination fields usually do not (it is probably safe to say 'never have' rather than usually do not have!). This means in the real world that while the left and right edges (for example) may be -10 dB the top and bottom edges may be -8 or 12 dB. Having both planes match is very important if you are going to get maximized gain out of the whole system. Guess what. The Super Feed has exactly matched 'E' and 'H' plane fields, within 0.1 dB. That's where part of its additional 'gain' comes from.

Again, this is not true with most horns since the E and H plane impedances are different (a function of the physical



SATELLITE TV RECEPTION MADE EASIER!

For those who are working with the Coleman or Howard TVRO system Manuals, here is a selection of PC boards, kits or assembled units which will get you 'up' and 'on-the-air' much sooner!

The following boards piggy-back to our LNA amplifier and active mixer boards to provide you with regulated powering for the important low noise amplifier stage(s):

Model	PC Board Only	Kit	Wired/ Tested
MRR (active mix biasing)	\$3.00	\$10.	\$20.
BSAB (bipole sgl bias)	\$3 00	\$10.	\$20.
FDAB (FET dual bias)	\$3.00	\$20.	\$30.

To recover satellite audio here are a pair of systems designed to provide 4 to 8 MHz tuning for subcarriers. When ordering wired and tested, specify subcarrier frequency. All boards edge mount for easy 'stacking'/switching.

Model	PC Board Only	Kit	Wired/ Tested
SAA-2	\$3.00	\$15.00	\$25.00

If you are fighting the battle of a suitable 70 MHz IF system with a built-in demodulator plus a channel 3 RF remodulator, here's your answer! To add audio, order one or more SAA boards. HOWARD Manual required.

Model	PC Board Only	Kit	Wired/ Tested
70HIF	\$10.00	\$150.00	\$300.00

All boards are supplied with complete data for construction. AND - call or write us about our NEW TVRO receiver!

ROHNER MACHINE WORKS
John P. Rohner / 7th & Elm Streets
W. Liberty, Iowa 52776
(319-627-4212)

SUCCEED with OUR DEAL for DEALERS

OUR TVRO SYSTEMS DEALERS
ARE FURNISHED . . .

- + COMPLETE SYSTEMS
- + SUPERB EQUIPMENT
- + REMOTE CONTROLLED
SATELLITE TRACKING
- + SALES PROGRAMS
- + TRAILER MOUNTED DEMO
- + TECHNICAL ASSISTANCE
- + INSTALLATION INSTRUCTIONS
- + FINANCIAL ASSISTANCE

WE HAVE MANY YEARS OF EXPERIENCE
IN ELECTRONICS AND TELEVISION
SALE AND SERVICE WHICH ENABLED
US TO DEVELOP A VERY SUCCESSFUL
PROGRAM FOR OUR DEALERS.

CALL US TODAY!

HOME SATELLITE TELEVISION SYSTEMS

DIV - RIECO TV SERVICE, INC.

6541 East 40th Tulsa, Ok. 74145

918-664-4466

configuration of the horn) and their respective focal points are therefore different.

Now what does all of this fine technology do for you?

We were fortunate enough to lay our hands on serial number one of this new feed. We wasted no time putting it to work. Tay Howard told us that with f/D of .4 we might expect to see an improvement in satellite carrier levels as great as 1 dB. We promptly put it on the 11 foot ADM antenna we have been utilizing for Molniya reception (see separate report this issue of **CSD**). The holes all lined up appropriately with the holes on our LNA and being purists we tightened up all 10 1/4 x 5/8 bolts. Now Molniya is supposed to be right-hand-circular polarized but **we have found** that at various points in its orbit our linear feed needs to be tweaked a bit to optimize the signal. In theory we shouldn't find the Molniya signal varying at all, as a function of polarization matching, since our linear feed probe will only be seeing 50% of the wavefront at a time anyhow. We found that there is apparently an 'optical-elliptical' format to the signal as it rounds the apogee point and we could pick up an extra dB or so by carefully matching polarization. With the 'Super Feed' in place we checked back and forth against a standard .4 f/D feedhorn. Guess what. Sure enough, we were averaging around 1 dB **better** even on Molniya with the Super Feed.

Next we tried the Super Feed on the big twenty foot monster antenna we have had up for nearly three years now. The f/D on this antenna is also in the .4 region. We moved off to ANIK since it is closer to sparklies than the US satellites. We were very surprised to find the additional signal gain, on our 20 foot monster dish, was **above** 1 dB; even approaching the 1.5 dB point. And here for nearly three years we thought we had been properly illuminating the 20 footer!

(We've had, through the years, a number of very qualified people out here for visits and one Scientific Atlantic super engineer even hauled a station wagon filled with test gear out to run a 'proof' on our system for us. Nobody had ever been able to measure our 20 foot system at the C/N level the computer runs said we **should** have. We were always low by nearly 1 dB. **I guess we just found it!**)

What does .5 to 1.0 dB buy for you? Well, let's see what options you might have if you have built a system that needs just that much more signal to get out of the sparklies.

1) **LNA** - let's say you have a 120 degree Kelvin LNA. You can't make the antenna reflector any larger, and the only way to get the carrier up is to get the noise down. If you need .5 dB more C to N, you would have to lower the N portion of the equation from 120 degrees to 78 degrees or so. If you have priced LNAs recently you know that a 120 will set you back \$800 or so but a 78 will set you back closer to \$2500. That's a tough way to pick up 0.5 dB C/N!

2) **Antenna** - you say you need 1.0 dB more C and you don't mind putting some more antenna up in the air? Well, if you have a ten footer to start with you will have to go to around 11.4 feet diameter (from 10) to get that 1 dB. You might put extender panels on to get that much.

When you boil it all down, the improvement in reflector 'efficiency' with an improved feed (in this case the 'Super Feed' by Chaparral) is probably the **least expensive system improvement you can add** to your system. Chaparral (P. O. Box 832, Lo Altos, CA 94022; 415-941-1555) has a list price in the \$135 region for this new feed. They ought to sell a ton of them and we wouldn't be surprised to see this feed become the 'standard' for home terminals in record time. We are just glad we got ours early...we hate waiting in long lines!

If you are new to the TVRO arena and are having some difficulty digesting all of this new technology all at once, you have possibly avoided any deep study of the subject of 'extra audio subcarriers' thinking that they can wait until you have the basic video section up and running. It may have escaped you that if you are going to have any audio to go with the much desired video signals sooner than later you are going to have to approach the sub-carrier detector problem.

Actually you have a number of audio demodulator options

EQUIPMENT REVIEW

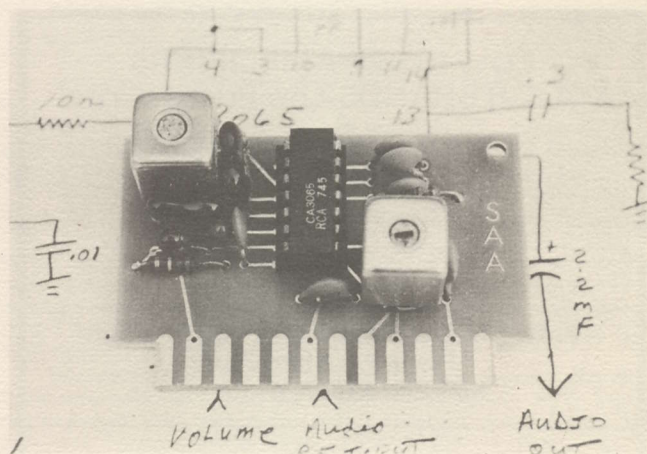
ROHNER

SAA DEMOD

available. The Howard TVRO Terminal Manual covers use of the CA3065/HEP 6063P integrated device that accepts FM subcarrier input and gives you audio output. Thousands have built up this approach. In the October 1979 **CSD** we covered an RCA standard module (PM-200) which is easily adapted for the same purpose; more discussion of this module appeared in the December **CSD** (page T11) and again in the May 1980 **CSD** (page T15).

Then there is a kit available which allows you to build up, for approximately the price of the RCA PM-200 module, a small audio sub-carrier detector. The supplier (Rohner Machine Works, 7th and Elm Streets, W. Liberty, Iowa 52766) sent us down one of these units to check out.

The model SAA (Satellite Audio amp-Demodulator) kit sells as a kit for \$15.00; or wired and tested for \$25.00. The unit is a 3065 device with a pair of tuned circuits to allow you to adjust (as in tune-up) the system to the particular audio sub-carrier you want picked off of the transponder.



Most TVRO receivers provide separate video (baseband) and audio (baseband) outputs. This is done by first allowing the video demodulator to recover all of the modulation information in the (typically 70 MHz) IF and then feeding everything in the demodulator **output** above say 4.5 MHz or so to a **separate** audio demodulator. The video information is at baseband once it comes out of the basic receiver demodulator while the audio, sent along as it were as a separate sub-carrier between 5.5 and 7.5 MHz, kind of thinks it is 'higher frequency' (video) information until you tell it that is not what it is! In short, baseband video (after PLL demodulation or discriminator demodulation) still has the audio (sub-carrier) tagging along as an 'RF' signal; it is not yet true baseband.

The aural sub-carrier demodulator is nothing more than a very simple integrated circuit FM receiver; it will accept any FM signal in the design frequency range (typically between 5.5

and 7.5 MHz) and detect or demodulate the (FM) audio.

The 3065 is an ideal device for this detection system since it has virtually everything inside of the 14 lead IC that is required to detect and process FM audio. All that is really 'missing' is a handful of small resistors and capacitors to feed voltage into the device and audio out, and, two tuned circuits.

Now without the tuned circuits wired into the 3065 internal parts, the 3065 'FM receiver' doesn't know which of the FM signals present to 'detect'. The tuned circuits are actually nothing more than 'filters' which when tuned allow you to select what portion of the radio spectrum between 5.5 and 7.5 MHz you wish to reach the guts of the 3065. Having 'filtered' out the noise and unwanted carriers with the tuned circuits, the 3065 has a 'clean shot' at the one carrier you wanted detected.

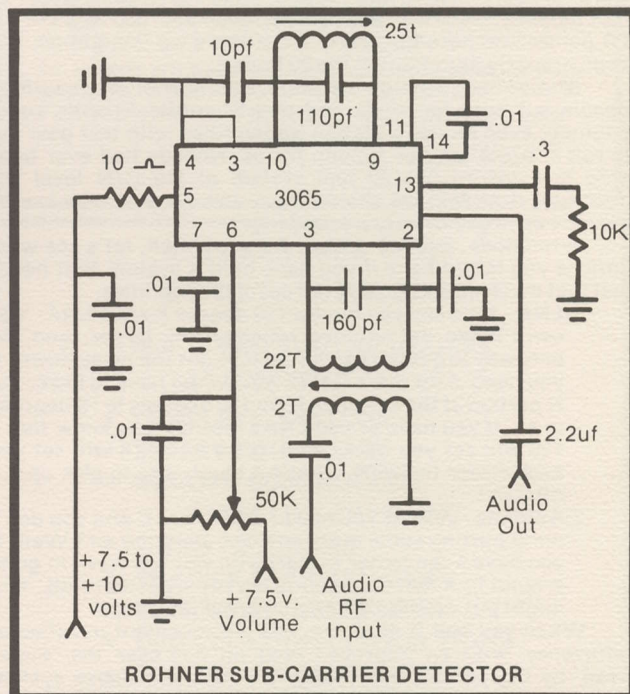
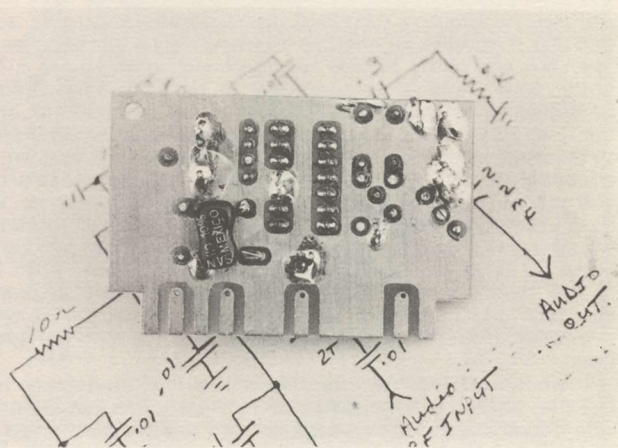
Rohner's SAA combines the tuned circuits, the handful of resistors and capacitors required external to the 3065 into a single package. Our particular unit arrived wired and apparently tested although we think most people would opt to buy the kit and pocket the \$10 difference. The trade-off is perhaps 1 hour of your time to wire the unit up; 40 minutes trying to figure out what to do where and 20 minutes actual wire-up time.

John Rohner is something of a computer-freak and he sends you your written instructions on a computer printout. There are 14 steps in all. Most are clear and concise if not beautiful. Step 4 has you taking the lid off of the two tuned circuit ('IF') cans and winding some wire around the forms. The coil winding instructions are fine for a 'pro' but we suspect a novice would not be able to tell from the instructions what to wind over what. John could clear this up we think.

Step number 10 tells you about hooking up the completed board; including where to apply voltage to adjust the volume on the output. This one, like step 4, will give no pro a problem but it is totally confusing to a novice. How much voltage to apply, and what value volume control pot to use, is missing.

The prior CSD literature on the subject of sub-carrier modifications of the PM-200 gave elaborate steps for tuning up the device. Tune up consists of tweaking the two tuned circuits

so that you start to hear audio coming out of the speaker. Most of the instructions told you to round up a signal generator and a scope and to adjust the two slug-tuned forms for maximum signal through the device from the signal generator. Since signal generators and scopes are not always available we decided to see if we could simply brute force the beast into audio.



We went into our receiver and found around +2 dBm of baseband garbage (signal). That we connected to the input. To the output we connected a two-watt audio amplifier we found at Radio Shack. Then we tuned up transponder 21 which has sub-carriers operating at 5.8, 6.8 and 7.4 MHz and we started playing with the two slugs. These powered-iron-like slugs are delicate by the way; you need a very small screwdriver or better yet a tough plastic tuning tool to slip into the slightly rectangular slot on the top of the slug to make them turn. Don't use much pressure, don't turn too fast, because after repeated tuning and turning you'll wear the slug material off the grooves and they won't turn anymore!

It took about 30 seconds to find sound. Not good sound but a start. In another minute we had the second slug tuned for much better sound and then in a final minute we had both slugs adjusted by ear for as good sounding audio as we had expected to have. Our bottom line is you don't need to spend several

LOW NOISE AMPLIFIERS MAJOR BRANDS-Low Prices-Write!

3.7 — 4.2 GHz DOWNCONVERTER

- 3.7 - 4.2 GHz in, 70 MHz out
- Remote, one control tuning
- Dual conversion - stable
- Assembled & tested \$895.

Polar Mount and Remote Feed Rotation Plans For Your Dish SUPER! \$10.00 postpaid

- Teflon PC Board dielectric constant 2.55 1/32" x 9" x 4" \$14.00
- Chip capacitor kit 12 each, 60 total! 18, 27, 39, 220, 470 pf...only \$18.00
- SMA and Type N connectors
- .141" Semi-rigid coax \$3.45 per foot
- 2" x 14" copper tube for Birkill feed. \$12.00

SATELLITE INNOVATIONS
P. O. Box 5673, Winston Salem, NC 27103

Add \$2.00 shipping and handling.

hours looking for a signal generator that tunes 5.5 to 7.5 MHz and a scope to tune these up; just use your ear!

Now the audio that comes out of the SAA board is not really great hi-fi audio. The audio that goes to the bird on the sub-carriers is **pre-emphasized** in an effort to improve the overall audio signal to noise ratio. To get the audio spectrum back into its proper spectral-bandwidth relationship you need to **de-emphasize** the recovered audio. Tay Howard places a .01 capacitor from pin 7 to ground for this purpose; Rohner does also. Clyde Washburn in his receiver spends a few more cents and another 30 minutes of builder time insuring that the de-emphasis network is capable of reproducing the true high fidelity audio that the satellite is capable of delivering. Someone with more time than we could probably study the Washburn Manual and develop a better grade audio de-emphasis system for the 3065 device. Mind you the audio is not bad; it simply could be better.

Rohner's SAA boards are designed to 'stack'; that is you can put several together (as Rohner does in his new TVRO receiver) to switch between the common audio sub-carriers between 5.5 and 7.5 MHz.

Other than the suggestions made here, we rate the Rohner SAA as a 'good value' and can recommend it to **CSD** readers. And this aside; we were concerned that there might not be enough 'range' in the two circuits to tune up to the Russian Molniya audio sub-carrier operating on 7.5 MHz. As those who have heard the Russian audio on our 'They Call This Bird Molniya' videotape will attest, indeed it does make it that high 'in the band' although here is a perfect example of not being able to adequately de-emphasize the audio since we do not at the moment know what the Russian's use for pre-emphasis.

TECHNICAL NEWS NOTES

CABLE people switching or adding satellite programming via WESTAR 3 are quick to point out that WESTAR's stronger-than-F1 signal will be a boon to smaller terminals. Many cable systems that will add terminals for '3' reportedly are considering ten foot dishes since WESTAR footprint is in 36 dBw region in central USA.

ARIANE L02 launch from Guyana aborted only 20 miles downrange from launch site. Loss is considered setback to ESA program to be independent of NASA. On board and presumed lost was OSCAR 9 amateur satellite package.

ROBERT COLEMAN's silence ends at this month's SPTS San Jose when he appears in STARVIEW Systems booth with new double-conversion receiver he will be manufacturing and marketing exclusively through STARVIEW. Unit has \$2,000 range list price (model number 3742), remote (by wire) channel change, AFC (on/off), polarity switching, dual audio recovery (one factory set on 6.8, second is varactor tuned over full 5.5 to 7.5 MHz range by user), scan tune (starts at bottom and goes through transponders holding on anything it finds for about 5 seconds), a vertical-horizontal polarization switching system tied to receiver controls, 20 MHz IF. First versions at SPTS use AVANTEK VTO devices but later versions will use frequency synthesizer.

NCTA cable TV convention managed to have 16 satellite

GENUINE

HOWARD TERMINAL PC CARDS

Bob Coleman and Tay Howard are now producing six PC cards which make duplication of the Howard Terminal (latest version) a snap!

- (A) Dual Conversion (4 GHz to 70 MHz) - \$25.00
- (B) 70 MHz IF and Filter - \$25.00
- (C) Howard Demodulator - \$40.00
- (D) Dual (2 channel) Audio - \$25.00
- (E) Single Channel Audio - \$15.00
- (F) AFC and Metering - \$15.00

These field proven and tested high quality boards are available as a five-board-package for \$99 package price (you receive A,B,C,E and F above). Included is complete documentation for construction and a list of parts stocking distributors.

Order from: Robert M. Coleman, Rte. 3, Box 58-A
Travelers Rest, S.C. 29690

TVRO dishes on display or operating. If you attend SPTS 80 San Jose we suggest you count the number of 'low-cost' TVRO antennas on site. NCTA with 8,000 attending is a piker!

WHILE cable TV programmers seem split on scrambling question and perhaps even leaning away from scrambling, OAK is now advertising Satellite Scrambling System with \$9,900 uplink scrambler and \$2,900 receive site scrambler. Delivery? Early 1981 at earliest.

PARAFRAME's Jim Vines recently awarded US Patent for his parabolic dish construction technique; PARAFRAME now producing antennas near Good Hope, WV.

FIRST South America domestic satellite system using dedicated bird(s) may be Brazil, Argentina and Chile. Talks are leading towards establishing non-DBS service utilizing 34 dBw birds to be shared primarily between Brazil and Argentina with Chile buying on agreement extra transponder space.

SPACE SHUTTLE continues to slip and now NASA itself is suggesting its own estimates are probably overly optimistic. First manned orbital flight now scheduled for March of 1981.

FCC sounds optimistic about ability to find orbit space for all of those firms who had filed by May 1st cut-off but insiders at Commission note "...if we can pull this off several of the applicants will not get the spots they requested". First serious study and announcements not until September at earliest.

FUJITSU reportedly has allowed a handful of GaAs-FET 'IC type' devices into US for early design purposes for what may eventually become semi-ICed TVRO front end for 4 GHz C band. Devices combine VCO and mixer into single 'chip', require around 25 dB of gain ahead of them at 4 GHz for 120 degree receiver noise figure, will delivery output in any UHF range (i.e. 500 to 1000 MHz) user wants and target price for 1981 delivery is in \$35 region!

US customers of INTELSAT can now get signals **directly from** international birds, no longer must satisfy FCC legal requirement that had them going through one of the US domestic carriers (RCA, WU, COMSTAR). Primary early beneficiary likely to be Ted Turner's CNN which has 11 meter terminal installed in Atlanta to pick off INTELSAT feeds.

ADOPTION of new Chaparral 'Super Feed' by original antenna equipment manufacturers as 'standard feed' likely to be nearly 100% of all antenna suppliers by San Jose SPTS. ADM, Satellite Television Systems, Starview and Paraframe evaluated the feed early, most indicating they liked it (see report this issue, Technical section). Microwave General Corporation meanwhile introduces three new feeds of its own at SPTS San Jose.

NOTICE to CSD subscribers: We **MUST** have the address label from your **CSD** mailing envelope with any request for address change; without label, your request will be delayed substantially. Contemplating moving? Take this month's label and stash it away in a safe place!



NEW MANUALS FROM STT



①

Stephen Gibson's 'THE SATELLITE NAVIGATOR' is possibly the finest manual ever assembled by STT. Author Gibson covers every aspect of satellite 'navigating' (i.e. the art of finding satellites from your spot on the ground) and **he builds into this latest STT manual** cleverly designed navigational aids including an inclinometer (to measure your antenna's elevation) and a Sun Compass (to help you accurately measure azimuth). Gibson goes from the very elementary mount (a laundry pole in the yard) to super sophisticated mounting systems including a complete electronic interface box to tie your motor driven dish antenna to your TRS-80 (or similar micro) computer for full 'autodish' operation. Filled with practical tips on mount design and construction, step by step instructions on 'boresighting' the satellites, computer programs galore and the word of an experienced man on trouble shooting your system. Bob Cooper says "I read this manual six times during the course of preparing it for publication; each time I found myself discovering new ways to modify my own antenna mounts. This manual may well be a curse to my spare time; after reading it I have dozens of new projects to get started on!" The price is \$30 postage paid US, Canada, Mexico; \$35 elsewhere. A must for any serious satellite terminal operator. See order card to right.



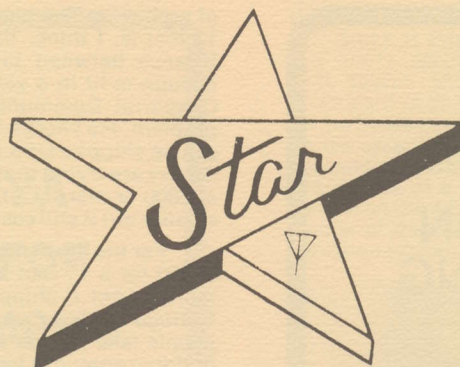
②

Nelson Ethier's 'PARABOLIC TVRO ANTENNA MANUAL' will probably make several people independently wealthy. Here is the full 'game plan' for starting up a business building 10, 12 (or larger) foot TVRO antennas, mounts and feeds. Nelson's manual will make everyone an instant expert on the nitty-gritty world of building superb, high-quality parabolic reflector surfaces. He uses a combination of fiberglass and metal to produce a professional looking, high-performance dish that virtually **anyone can duplicate** from his step-by-step plans for between \$300 and \$500. PLUS - he suggests that after you build a mold for your first dish that you rent the mold around to others in your area so that you in effect become a supplier in the antenna field! Nelson is a bug for having precision workmanship and he gives you complete instructions on achieving a 1/8th inch surface tolerance over the 12 foot surface. Formulas and instructions included will assist anyone who wants to build larger-than-12 foot antennas to do so. What a neat way to turn your garage into a factory! The price is \$30 postpaid in US, Canada and Mexico; \$35 elsewhere. Don't start building your own antenna until you study this manual carefully!

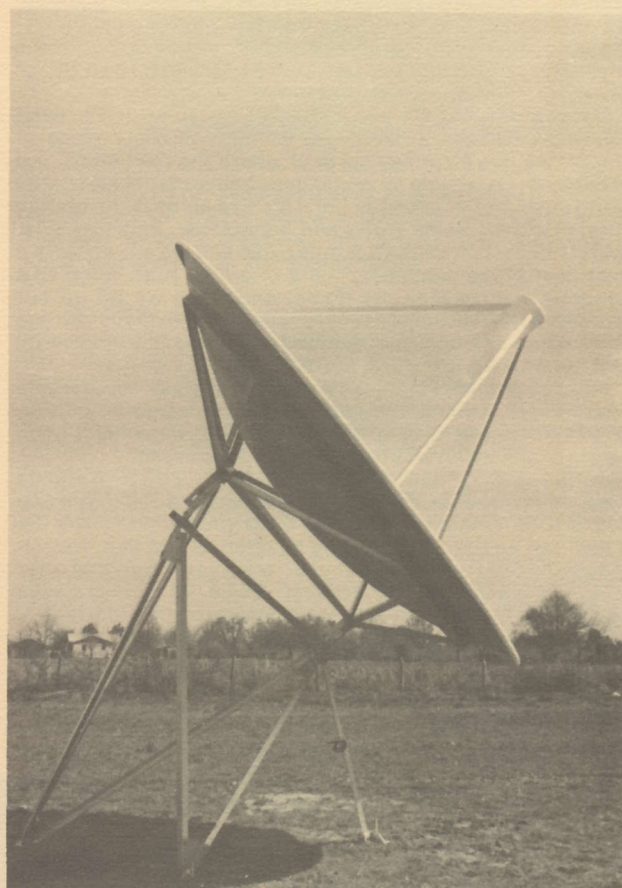
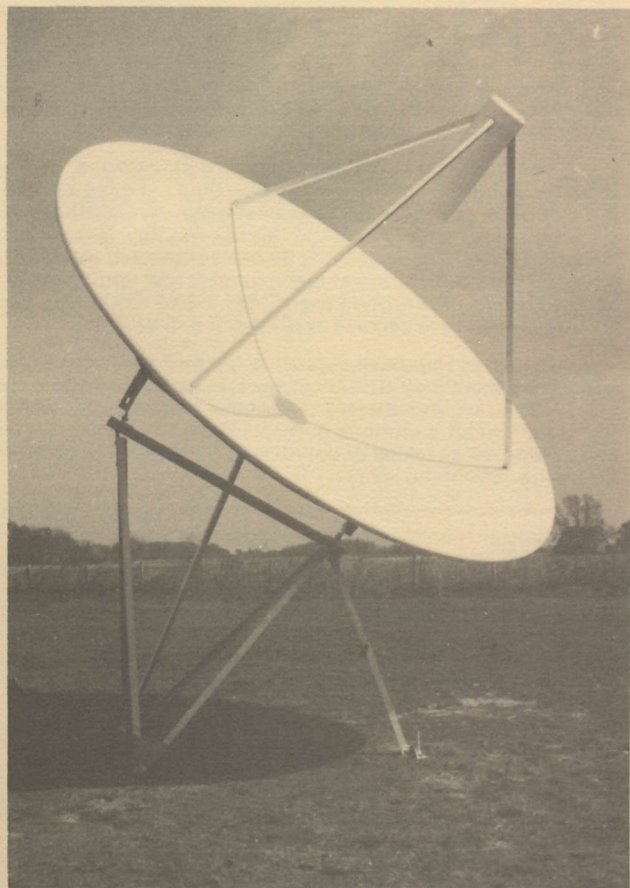


③

Bob Cooper's 'SATELLITE OPERATIONS MANUAL' probably should be kept under lock and key in your TVRO viewing room. Coop has been assembling data from people who like to mess around tuning in 'the hidden stuff' on satellite transponders for years and now he gives away all of the trade secrets. Like finding network executive intercom audio channels, news-wire teletype channels, the Moscow-Washington 'Hot Line' RTTY and voice link back-up on Molniya and more mundane stuff like several dozen Holiday Inn 'Holidex' ® 800-number reservation lines on satellite. He tells you where to tune in four different Anchorage, Alaska AM radio stations sent out via satellite, Alaskan flight weather, and hundreds more. PLUS - this manual is more than a clandestine sourcebook for the secret services. It includes dozens of step-by-step instructions for LNA and feed system operation, sub-carrier units, and a whole chapter on the latest Russian Molniya reception techniques. It even has a section detailing re-broadcast of satellite received channels via low-cost VHF television translators (including a look at such an installation). A section on trouble shooting your system; more than 20 chapter-sections in all! If you are into satellite reception, you need this new Coop manual. If you are thinking about getting into satellites, one look at this book and you won't rest comfortably until you too have your terminal up and running! The price is \$30 postpaid in US, Canada and Mexico; \$35 elsewhere. See order card to right.

BRING
HOMETHE
STARS

PROFESSIONAL PICTURES and satisfied TVRO customers start with professional antennas. Our STAR Antennas feature rugged corrosion resistant construction with high quality fiberglass, Marine aluminum and stainless steel. Our surface is metallic flame coated. **Dealers** love our fast antenna installation time (no special tools or jigs!). **Users** love our environment LNA shield covering rotor cables and LNA cables. **Everyone** loves our super-high efficiency parabolic surfaces that outperform larger size antenna. **PLUS** - STAR Antennas have the exclusive VARIDEC single axis mount that eliminates declination adjustments found on competitive polar mounts!



SELECT the appropriate STAR Antenna to bring home the 'Stars' to your area. **Model SRO 4F** is 4 meter 'unit' construction with gain of 42 dBi. **Model SROS 4F** is the identical antenna in three piece segments for shipping; still 42 dBi! **Model SRO 3F** is 3 meter 'unit' construction with gain of 40 dBi. Delivery on all antennas, 15 working days from receipt of order!

STAR

STAR ANTENNA products and complete TVRO systems (featuring the best TVRO receivers and LNAs at very competitive prices!) are available from **Satellite Television Systems, Inc.**, P. O. Box 51837, Lafayette, LA 70505 (318-234-2495).

FOR the name of the nearest dealer to you, or an opportunity to become a dealer, contact **Star Antenna Manufacturing, Inc.**, P. O. Box 51902, Lafayette, LA 70505 (318-984-0992).

COOP'S COMMENT ON PROGRAMMING

COTTAGE INDUSTRY

I am not sure how your dictionary might define 'cottage industry'; my dictionary jumps from cottage cheese to cottage pudding without a mention of industry.

So I'll try to define it. If you decide to set up a business in your home ('cottage') and you run and operate the business from your home, **that's cottage industry**. No big time staff, corporate offices or multi-media image. You just set out in the comfort and privacy of your own home to do 'your own thing' and hopefully you make a few bucks at it.

I identify with 'cottage industry' because that's what Susan and I do here at STT. Our home is also our place of business; we live six miles north of where the road stops, out here between Oklahoma oil wells (none belong to us) and herds of cattle (also, none belong to us). Our five acres is devoted to raising antennas, some fruits and vegetables, and two kids. The Arcadia post office is a 6.5 mile drive and we are Arcadia's largest post office customer. It's a one-man post office (the Postmaster also sweeps the floors) and when we fill up our meter with \$3,000 in postage every couple of weeks you can see his eyes roll to tilt because he knows he'll get 3,000 or so large brown envelopes back to process in the next few weeks.

I think the home satellite TV industry is a perfect example of an area where you and hundreds like you could be getting yourself 'independent' of an 8-5 job and being dependent upon some big shots' whim whether you have a job or not.

In the brand new **Nelson Parabolic TVRO Antenna Manual** author Nelson Ethier makes the suggestion that if you build his 10 or 12 foot antenna, the mold you build to make the first dish can be used and re-used as often as you like. Nelson suggests that if you rented out your mold after building your own antenna, you could recover some or all or even more-than-all of your own antenna's cost through mold-rental-fees. Nelson further suggests building 10 and 12 foot antennas for a living would be an excellent 'cottage industry'. I think he's hit the nail squarely.

I've watched with interest and pain and even dismay the comings and goings of 'national' antenna manufacturers. I see lots of promise in some of the designs offered but I also see lots

of problems. The biggest one is the shipping problem. A 12 or 13 foot is, I think, the ideal home-sized antenna; the perfect balance between big-enough for good pictures and small enough to fit in a yard. Alas, it appears only Bob Taggart of Chaparral Communications has really solved the shipping problem. He knocks his ten foot down into four packages that can be shipped UPS or parcel post for around \$60 worst case. Others are trying to ship whole 12-13 footers with delivery fees of \$600 or more. Cutting the antenna in half makes the boxes smaller but it still costs a bunch to ship these 'big' sections.

For the life of me, I can't see why anyone would spend say \$1500 for a 13 foot antenna and then spend another \$500 or more to get it shipped to them, if they had an alternative. **Cottage industry' could provide the alternative.** Simply let 50 people take Nelson's plans in the new manual and each start building antennas for local delivery. If you really operated tight like Susan and I do, you could turn out one antenna per week once you got the hang of it. If you spent \$500 in materials and finishing, that would make you \$1,000 a week for your efforts. You could even afford to cut the price below \$1500. Moreover, there's room in the business for not 50 but perhaps 500 such individual 'cottage industries'. This whole field is growing, in case you haven't noticed!

Antennas are but a single example. The new **Gibson Satellite Navigator Manual** from STT has several very innovative terminal test instruments and dozens of really creative antenna mounting and rotation system ideas; completely worked out for duplication. I know Steve Gibson isn't going to go into the production of these; I would urge others to look at what Steve has pioneered with an eye towards starting a 'cottage industry' in their own cottage.

I can tell you from experience that being a 'cottage industry' is both frustrating and rewarding. The big reward is the complete control you have over your own destiny. You probably won't become independently wealthy (we certainly haven't!) but you will probably do better than you would at an 8-5 job. There are tax advantages as well that you'll probably need advice on; everything associated with TVROs you might acquire for example become expenses or depreciable.

No, I am not advocating putting the national antenna folks out of business. They'll do alright or fold without any help from me; either way. **But there's room here** in both antennas and 'gadgets' for an ambitious person to get off on his own and away from the shackles of an 8-5 routine. Think about it; the time to do something is now!

OUR COVER

Making Moniya play. It started with assembly of an 11 foot ADM dish aligned on a 'strange' polar mount bearing of 22 degrees from Oklahoma and ended with successful acquisition of an entire string of Molniya inclined orbit satellites transporting television from Moscow to more than 10 time zones in the USSR. When it's 8 AM in Siberia it is midnight in Moscow and 4 PM 'yesterday' in Oklahoma! Thanks to volunteers Tom Gardner and Larry Fansler for their devotion to the cause.

CS
D
PROGRAMMING



COOP'S SATELLITE DIGEST (Programming Section) is published monthly by Robert B. and Susan T. Cooper doing business as Satellite Television Technology (Ltd.), P. O. Box G, Arcadia, OK 73007 (USA); 405-396-2574. **CSD** is not affiliated with any satellite programming distributor, hardware (equipment) manufacturer or distributor nor satellite systems operator. STT sponsors the Satellite Private Terminal Seminars (SPTS) held three times per year and does produce and distribute 'learning' materials and 'how-to-do-it' manuals relating to the development of the low-cost satellite TV receiving system industry. Subscription fee is \$50 (US funds) in advance Canada, US, Mexico; \$75 (US funds) elsewhere. Copyright 1980 by Robert B. and Susan T. Cooper.

SUCCESS WITH MOLNIYA JUST IN TIME FOR MOSCOW OLYMPICS

GETTING RUSSIA'S BIRDS

There is an old saying that if it is fun to do it must be indecent, immoral, illegal or fattening. This thought kept coming back to mind as Tom Gardner and I cranked the 11 foot stock ADM antenna around and about through a carefully pre-calculated hunk of northeastern sky searching for the MOLNIYA inclined orbit TV-carrying Russian birds. Here we were, some fifty or so feet north of the (to us) huge 20 foot, 3,000 pound USTC dish which had sat in its place in the side yard for nearly three years now gently pointing south towards the Clarke orbit belt...parked on a concrete slab with an old table filled with modern electronics gear and a satellite antenna pointing 'the wrong way.' The day was warm but not nearly as hot as the prior day when we managed to get the ADM checked out on 9 different US/Canadian birds. Stacked up on the table was a Sony PS1850 tri-standards color monitor (with switch selectable NTSC, PAL and SECAM color standards), a Sony 8 inch NTSC video monitor, a Kenwood R-1000 0 to 30 MHz communications receiver, a Microwave Associates LNA power supply, various pieces of test gear and the smallest box on the table - our prototype SAT-TEC 24 channel TVRO receiver.

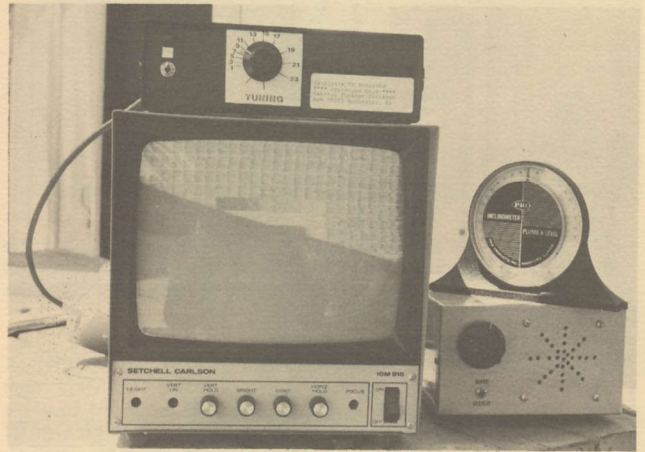
The SAT-TEC receiver (see separate equipment review/report this issue) had arrived on a Friday. When I handed it to enthusiast Gardner the next day he turned it over in the palm of his hand and muttered "I think I could get this into my coat pocket!". Later that day it proved itself against everything else we had in the house at the time including a \$7,000 super-threshold extension receiver from a prominent international manufacturer.

Having proven the terminal on Saturday on domestic birds we started off on Sunday morning by swinging the antenna Mount around 180 degrees. We had scribed a north-south (true) line on our concrete slab and it was a simple task to re-align it as if the Clarke orbit belt was north rather than south of us. I had tacked on the side of a tool shed a carefully drawn diagram provided by English experimenter Steve Birkill. Steve had taken the time to help this bunch of 'Yanks' look for MOLNIYA by calculating where his own observations indicated the Molniya orbit should 'apogee' from our Oklahoma vantage point. The heading would be 60 degrees up and 22 degrees east of north. The frequency would be 3875 MHz; roughly transponder 9 in the domestic service.

Using an inclinometer and a compass we calculated and adjusted the antenna to the expected apogee point and turned everything on. Nothing. We time noted 10:30 AM. However we would probably have fallen to the concrete had we found something first shot since the Molniya birds are moving all of the time and they would actually be in the top of the apogee loop only for an hour or so and it would be 5 to 7 hours later before the next one came along in that same spot. So we began to systematically search the sky either side of the Birkill-projected coordinates. Steve had drawn the six hour portion of the orbit for us and he had even taken a red pen and outlined a triangular shaped area of the sky where we should look since he admitted his calculations could be 'off' by as much as +/-5 degrees. Unlike the Clarke orbit birds where you have to determine elevation from your location and the azimuth to a fixed point in the sky, we were looking for a moving target and our English instructor admitted he could be off over a 10

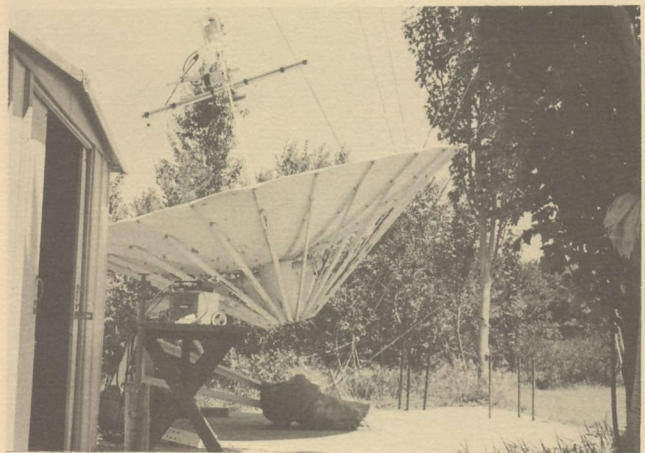
degree span.

Since at this point we were optimistic and fully believed the 100% accuracy of Birkill's navigation we decided the first search should be from the projected apogee spot downward in both directions. MOLNIYA is known to transmit for six hours per bird on the above-Canada apogee; three hours on the ascending pass towards apogee and three more on the descending path. So we tracked first one and then the other a 1/2 degree at a time turning and twisting the elevation jack control on the ADM antenna and them sweeping the antenna a couple of degrees left and right in azimuth after each new elevation setting. Nothing.

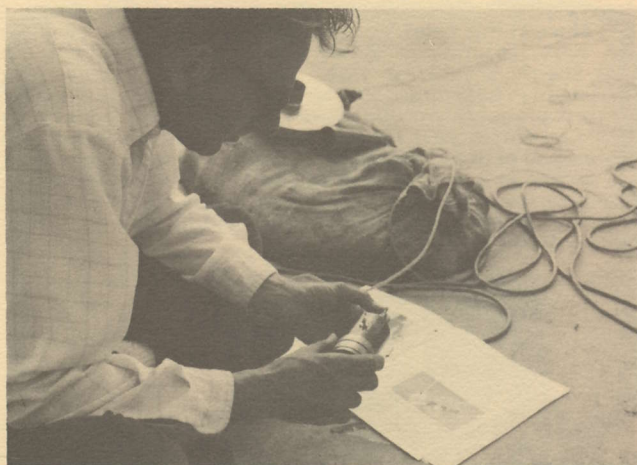


BASIC MOLNIYA INGREDIENTS [less antenna!] - a black and white monitor [yes - that's a Russian test pattern faintly visible], tuneable receiver, an 'audio box' and the most important tool of all...the inclinometer!

By 1 PM the possibility that Birkill might be correct with his own suggestion that his figures might be +/- 5 degrees was becoming more and more likely. But we **had managed** some success; which only tended to confuse us more. On one azimuth sweep that had us pointing perhaps 10-15 degrees west of our 22 degree (true) intended boresight **we had found a carrier**. It turned out to be on about US transponder 13. When we came across it the screen darkened on the Sony monitor and as Gardner fine-tuned first the elevation and then the azimuth we could see virtually all of the 'sparklies' disappear. When we



TROPICS? From Oklahoma MOLNIYA doesn't turn off on some orbits until the antenna is operating at an elevation of 74 degrees nearly overhead!]. We decided that alone was kind of scary...Russian TV live from Moscow right above us.

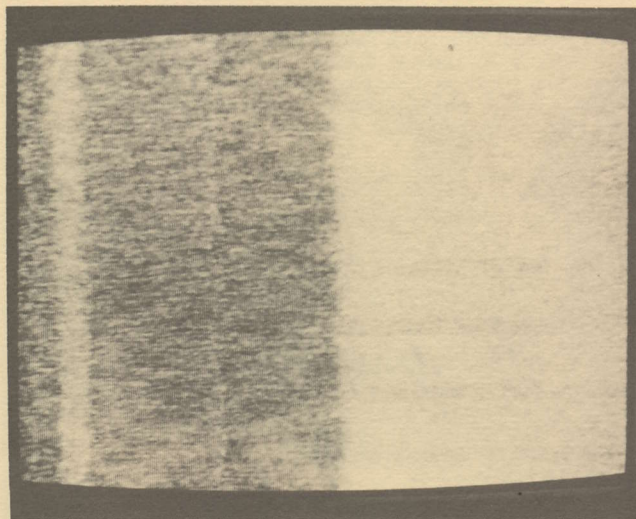


BIRKILL HYBRID MODE FEED - Tom Gardner studies the SMA fitting installed by Steve Birkill on his circular polarized feed deciding how we would get a bulky N type fitting on the tube in place of the small SMA.

first found it, we thought for an instant we had our MOLNIYA TV bird. Then the reality that we were perhaps 100 MHz high for MOLNIYA TV at 3875 MHz sank in and we went to work figuring out what we did have. First of all there was no sign of video modulation; no sync, no framing. **But there was a signal.** So unhook the video monitor and plug into the Kenwood R-1000 communications receiver. Any carrier fat enough to almost wipe out the sparklies had to have some intelligence on it someplace!

We found a raspy sounding, 50 Hz modulated carrier at 1701 kHz. But nothing else. We were still not sure we didn't have MOLNIYA TV since by now we had been on this signal source long enough to have noticed that it was indeed moving through the sky. If it was not a MOLNIYA TV bird, it **was** another MOLNIYA family bird on an inclined orbit!

Over the course of the next hour we found five such birds; each in a pathway that suggested some were but 30 to 45 minutes apart in the inclined orbit chain. All had the 1701 kHz frequency carrier. Two we found **also had** carriers at 384 kHz. (NOTE: These 1701 and 384 KHz carrier frequencies are what you get **after** receiving the incoming 4 GHz range signal,



PULSE AND BAR pattern was first 'video' seen. This was using standard ECA linear horn on feed, 180 degree K LNA, ADM dish and SAT-TEC receiver. Not great but we were plenty excited!

frequency convert them down to 70 MHz, demodulate the carriers and then take the baseband (0 to 4.5 MHz) output from the SAT-TEC receiver and run it into a communications receiver tuning the 0-30 MHz range. The actual RF carrier frequency would be much closer to 3975 MHz.) While tracking one we heard it start 'quivering' as if the satellite was either spinning or the ionosphere was scintillating the downlink signal. After it waivered for perhaps ten minutes the carrier suddenly turned off. Hummm.

Well, as interesting as all of this was, we sure weren't watching the Russian Ballet which had been our objective. So back to the drawing board. OK - we had found five birds, none with TV on them. They were all moving (as evidenced by our constant need - every ten minutes or so - to reapeak the antenna) and they all had the same 'sound' and pattern in the sky. It bothered me for awhile that the two AO carriers (1701 and 384) were 'common to' a couple of the stronger 'mixer carrier' frequencies one finds on most Bell operated Telco links but I had never heard of a Bell Telco link moving through the sky so quickly dismissed the possibility that we were experiencing terrestrial interference. The 50 Hz 'gargle' of the 1701 kHz carrier pretty much cinched it even if the MOLNIYA type orbit we noted was not sufficient evidence.

We knew this particular orbit train was west (in our sky) from where Birkill had said we **should find** the MOLNIYA (type) 3 TV birds. We went back to the portion of the sky where Birkill said we should look...and looked again. Still nothing.

Now Tom Gardner had been fighting the ADM antenna mount for almost two solid days at this point. As nice as it is, the never intended it for extensive sky searches a sector at a time. And having the antenna mount aligned for **true north** when the bird's paths were predicted to be 22 degrees **east of north** was a big hassle. This meant that everytime we made an elevation adjustment followed by an azimuth sweep we were **not really** doing a straight east-west (or west-west) sweep; the sweep was more of a letter 'U'. We had rationalized that this **didn't really matter** since sooner or later, if we did systematic sweeps after each 1/2 degree adjust of elevation, that we would simply build a 'stack of 'U'' 's' across the sky and catch every part of the Birkill triangle.

Gardner finally decided he wasn't going to 'buy that' line of reasoning any longer and so we drew a new line on the concrete slab; it ran from 22 degrees straight back to 202 degrees. Then we huffed and puffed and jockeyed the 500 pound antenna plus mount around so it looked **straight up the 22 degree heading line.**

"Now let's start over" proclaimed Gardner. Five minutes later we had MOLNIYA TV on the screen. It was 3:25 PM CDST in Oklahoma and 11:25 PM the same day in Moscow. Apparently the Russians go to bed early; they were transmitting a Pulse and Bar test pattern!

Well now, this was more like it. We checked the azimuth and then the elevation. The bird was 65 degrees up and 20 degrees east of north. A quick check of the Birkill data revealed we were not only inside his 'red box' but **we were dead-on** for a bird that was in the descending node and about 3 hours out of apogee. And so we tracked it. Yes, every ten minutes or so we had to readjust the elevation and then the azimuth although the elevation was where most of the activity was. By 3:52 PM it had moved to a location 69 degrees above our horizon and 22 degrees east; in about 30 minutes it had changed by 4 degrees of elevation and 2 degrees of azimuth; plus or minus our crude navigation equipment! Again we checked the Birkill data; no question now, the bird was going away from apogee and would in short order be at the edge of the red-marked zone Birkill had drawn for us (boxing in the 6 hour average active-period of each MOLNIYA in the train). At 4:17(09) they dropped the test pattern but held onto the carrier. There on the right hand edge of the screen was the wavy black line caused by the Pulse Width Modulation (PWM) getting into our American standards receiver. At 4:18(29) the Pulse and Bar display returned. It stayed up until 4:24(58) and then they returned to the unmodulated carrier. At 4:30(00) the bird left the air; precisely as it crossed over the red-perimeter line Birkill had drawn on his graph for us!

A few words here about this whole system might be in

order for the newer readers of **CSD**. The Russians have two separate satellite systems operating; one, like our own and INTELSAT (etc.) hangs out over the equator in Clarke/geostationary orbit (the Russians undoubtedly have somebody **they claim** dreamt up the geostationary orbit belt before Arthur C. Clarke did in 1945!). The nearest such bird to North America at the present time is the Ghorizont (loosely translates to 'Horizon' in English) at 14.5 degrees west. Then they have the inclined-orbit system called MOLNIYA which comes over the top of the world at us from our north. At the MOLNIYA perigee (closest point to surface of the earth) it is approximately 580 km up; very close. At the apogee it is some 39,800km up. The apogee interests us because this is the portion of the pass which the Russians utilize to transmit a single channel of national television over all of Russia. And **the sub-satellite point** (i.e. the point on the earth or ground where the satellite is directly overhead) is at roughly 63 degrees north and 80 degrees west. That's dead overhead for a spot on the map called Mansell Island in the northern Hudson Bay of Canada.



TALL, SKINNY RUSSIANS! If you fail to adjust your vertical linearity the Russian 625 line/50 Hz based 25 frame per second rate will elongate the people. Note the Moscow time 'supered' lower right; 05:54. That's 1:54 PM in the afternoon in Siberia where this transmission is beamed and 9:54 PM 'yesterday' in Oklahoma! The man is delivering a news brief, or 'Novosti'. They sure mention 'Carter' a lot!

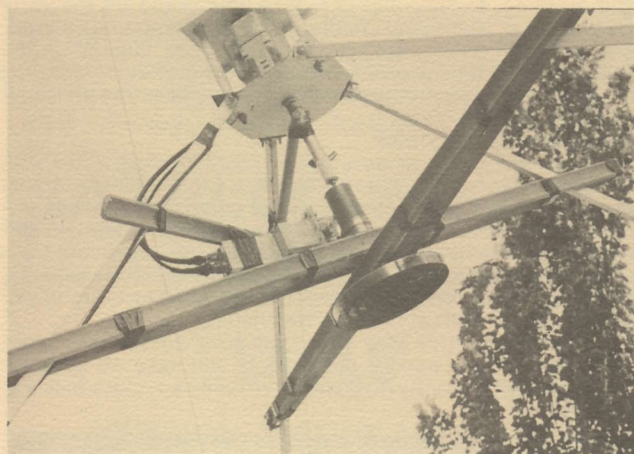
Because the inclined orbit birds move, you have to track to stay with them. Fortunately they elect to utilize the apogee for TV broadcasting and the apogee is so positioned that for an hour or so right at apogee the bird moves less than 1 degree; you hardly have to adjust the antenna at all. MOLNIYA transmits TV for three hours before and after apogee and then as the particular bird you are watching shuts down another bird enters the apogee zone and switches on; as the other bird is entering the six-hour apogee period.

If you can point your dish to a spot in the sky directly above Mansell Island in the northern Hudson Bay at an elevation that is 39,800 km above that sub-satellite spot, you'll be watching Russian TV pretty soon!

Now we found that in addition to television we could also hear AO (unmodulated) carriers in the baseband region on five frequencies: 108, 124, 140 plus 170 and 186 kHz. Yes, we see the 16 kHz 'pattern' to them and no there was no sign of TV 'sync' information on these carriers.

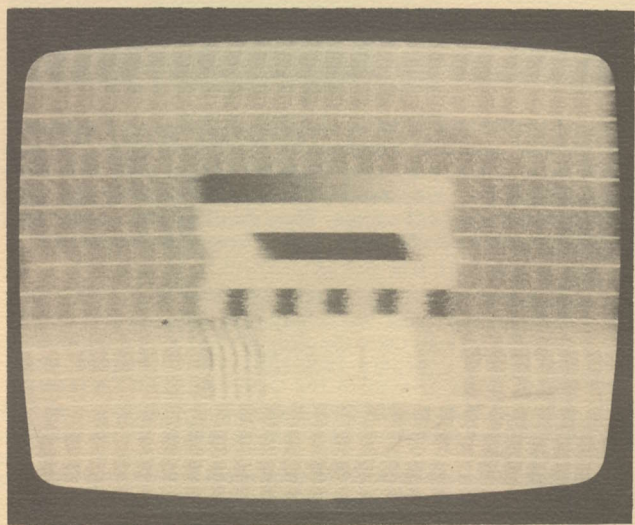
Birkill, who has been watching Russian television for

several years, says that except for a few hours per day of test patterns the Russian MOLNIYA 3 series birds are carrying video programming all of the time. Our first encounter just happened to be one of those periods when test pattern was 'up'. Audio? Well, that takes a pretty elaborate system for MOLNIYA (see complete description in April and May **CSD**) although Ghorizont requires just a sub-carrier detector capable of tuning to 7.5 MHz. We haven't gotten that far yet.



WITH THE HYBRID MODE feed installed we were in tall signal! Gardner decided the best way to insure the bulky scalar-hybrid mode feed stayed exactly at the focal point would be to build a wooden 'lattice' works around it. The LNA connects directly to the N connector on the feed with a male to male N Amphenol fitting. Pretty it is not; work it does [our apology to Steve Birkill for 'desecrating' his beautiful feed in this manner!].

There are some strange (as in unexplained) facets of Russian MOLNIYA television. This is thought to be their national 'Moscow' service channel. Now Russia (or more properly the USSR) extends from Latvia on the west to Siberia on the east; that takes in more than 160 degrees of this circle we call earth. And that includes around 10 time zones. When it is



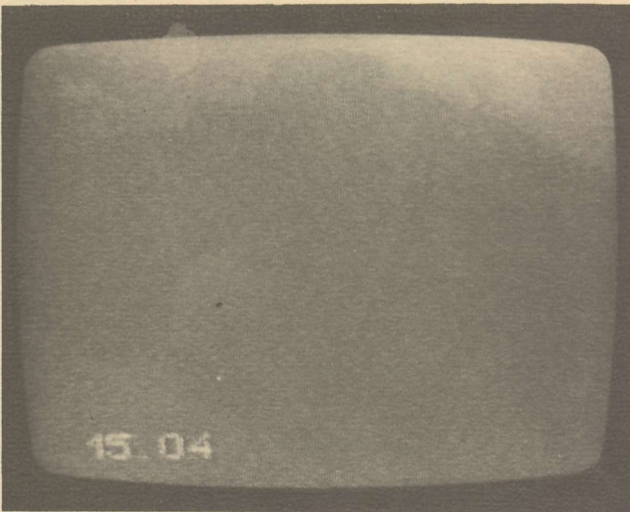
STANDARD RUSSIAN TEST PATTERN - notice the black center rectangle; no sparklies! With the hybrid mode installed we were out of 3.7/4.2 GHz 'sparklie noise' although our baseband system still had some fine-grain video noise in it. We estimate Russian EIRP to be in 32-33 dBw region into USA.

10 PM in Latvia (the western edge) it is 8 AM in Siberia. Which explains why the 'Moscow Channel' via MOLNIYA is active virtually 24 hours per day. Yet, as Birkill notes, after Moscow closes down their own 'time zone' service around 9:30 PM Moscow time (which essentially closes the service shown for Moscow-west to Latvia) about 60 to 90 minutes later the service renews again except now it is transmitting children's programs such as you would see here in North America at early to mid-morning. It (fits) that in Siberia this would be the early morning (i.e. traditional children's TV programming) period; but, as Birkill notes, they run electronic clock 'supers' on the screen and the time shown is Moscow time (around midnight!) Why they run Moscow time for the kiddies 8-9 hours east is abit baffling to say the least.

The Equipment Required

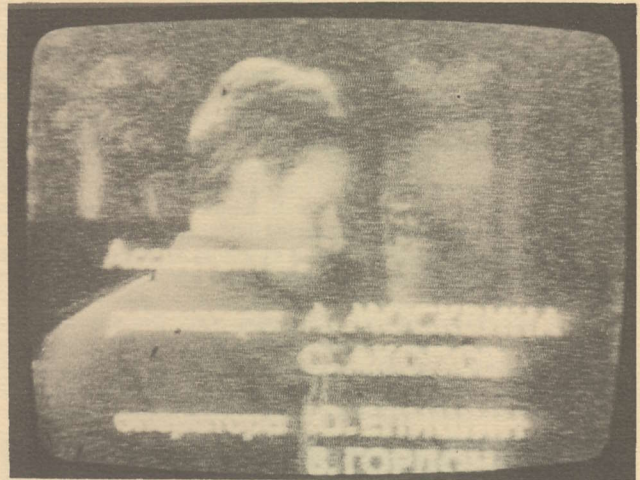
We went into this figuring if we could produce video with an 11 foot ADM antenna, a 180 degree K LNA, linear polarized feed (MOLNIYA is right hand circular polarized and when you capture it with a linear feed you give up 3 dB of signal right away!) and a stock home-type TVRO receiver, we would have proven that you don't need to be the CIA to watch Russian TV in North America. We did just that. Not great pictures mind you (around 3-4 dB CNR at first) but watchable.

From those first May 18th tests have come many more tests and a firm handle on what it will take to produce reasonable high quality Russian TV virtually anyplace in North America.



15:04 IN MOSCOW [7:04 in Oklahoma]. Programs generally start on hour, may end at odd points. If program ends after half or full hour point, they may transmit screen only with time 'supered' or they may revert to test pattern until the next 'natural' start up point comes. They don't fill the carrier with TV programs constantly, even during 'broadcast' segments.

- a) **Antenna** - We recommend a 16 footer equipped with a right hand circular mode feed. The antenna surface you can find on your own; the circular feed is best duplicated out of the February 1980 CSD (Birkill Hybrid Mode Feed) or as printed in the Coleman TD-2 Conversion Manual. Yes, an 11 foot will work and if equipped with a right hand circular feed will produce fair (if not perfect) pictures.
- b) **LNA** - any standard 120 degree K LNA will do just fine.
- c) **Receiver** - Any phase-lock loop demodulator will produce good video. The April and May CSD'S told you to get audio but since it is only in basic Russian you may not want to fool with it.
- d) **Monitor** - if you plug into a standard (North American) NTSC monitor you will notice all of the Russians are tall AND SKINNY. They aren't really; you need to readjust the vertical linearity (about 17% down) to compensate for their standards. You'll have a waivery ragged black



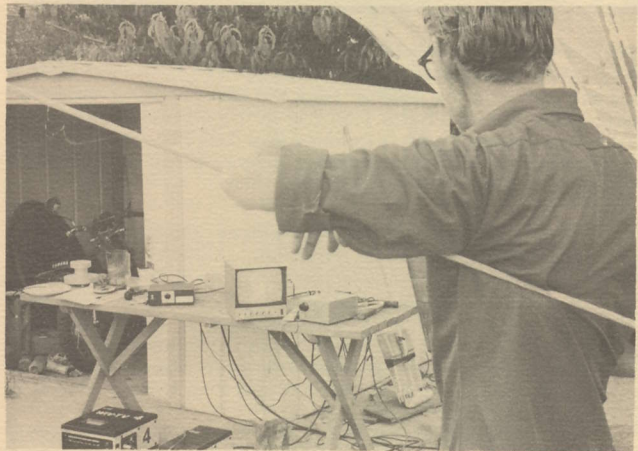
RUSSIAN 'period-plays' set in late 1800's and early 1900's are popular themes. The 'noise' you see is not actually in the TVRO system but rather in our Satchell Carlson video monitor (i.e. it is baseband noise, not RF noise). Very fine grain, we eliminated it by building up a series of baseband filters following data in Washburn Manual to keep all TVRO receiver 'noise' demodulated above approximately 4 MHz out of the video input to the monitor. Extensive discussion of suitable monitors appears in Coop's Satellite Operations Manual just released by STT.

edge on the right hand side of the screen: ignore it.

- e) **Tracking** - From reading this you now know where the Sub-Satellite point is located.

With the 16 foot antenna et al suggested, you'll have high quality (in the 40 + signal to noise ratio class) video. Don't try running the video into a tape recorder even though your NTSC monitor will produce tall, skinny Russian people your VCR won't 'copy' the strange sync signals present. We simply did a 'transfer' by shooting the video directly off the TV screen with a camera (that is the least expensive 'standards conversion' system of all!).

For the high technology types, we are still quibbling over



ENJOYING FRUITS OF LABOR - "The Molniya 4 PM [CDST] newscast scares the pants off of me" says Gardner. "Their Afghanistan news film is bad enough; but when I see US news film showing US protest marchers carrying signs promoting America 'admitting' her 'crimes' in Iran or protesting US abstention from the [Moscow] Olympics...well, no telling what the announcer is saying when that film is rolling."

what the MOLNIYA global beam antenna pattern EIRP might be. First reports (years ago) suggested 29 dBw. More recently Birkill ran across some data that suggested it would be around 31 dBw at **beam edge** and 34 dBw at boresight.

Our checks suggest that the 34 dBw number is closer to being correct; but you have to back 3 dB out of that for a linear feed (i.e. effectively a 31 dBw level). We are still checking and cross checking and we'll all come to a conclusion on this one day. For now we know a below-par system **will** copy the signal.

For the super spies out there, unresolved is the question of what in the world that 'other MOLNIYA' track set of satellites we first copied might be (as noted early in this report). Also unresolved is on what MOLNIYA system is the US-RUSSIA (Washington-Moscow) backup 'hot Line'. There are two 'Hot Line' circuits in use via satellite; one via one of the MOLNIYA family and another via INTELSAT. Wouldn't you just love to hear some U.S. technician saying "Hello Test - Moscow" on MOLNIYA some day!

("Aaah Mr. Chairman, this is Jimmy Carter. Do you have a few minutes to chat about those missiles you people are erecting around Guantanamo Bay?")

EQUIPMENT REVIEW

SAT-TEC'S \$995 TVRO RECEIVER

THE SAT-TEC GOODIE

Those who traveled the road to SPTS '80 in Miami looking for an off-the-shelf supply of good working home satellite receivers to truck back to Oshkosh (or wherever) were understandably disappointed. Few of the receiver suppliers to the industry were really ready to talk about large orders (actually everyone **talked**; few could deliver) and possibly this failure on the part of the receiver supplier exhibitors present has had a major part in contributing to getting fewer dealers than we anticipated off the ground before SPTS '80 San Jose.

This is primarily a review of the construction and performance of the new SAT-TEC \$995 (list price) 24 channel receiver. But interwoven into this report is a message for all would be dealers and distributors. Read carefully.

There are three ways to build satellite TV receivers. All have manufacturing advantages, some may even have performance advantages. The first trick is to get the 3.7 - 4.2 GHz satellite TV energy away from 3.7 - 4.2 GHz in as big a hurry as possible. Why? Because anything you do to the signal at 3.7-4.2 GHz is dangerous and it requires that you utilize component parts and sub-assemblies that are in very short supply. And they are expensive.

Andy Hatfield's AVCOM receiver, for example, follows what might best be termed 'conservative, traditional design approaches'. Andy realized nearly 18 months ago that his receiver would only be viable on the market if he was able to design it and then duplicate it with reasonable speed. He opted to do his 3.7-4.2 GHz conversion work utilizing appts that he didn't have to wait long periods of time to get and he on purpose stayed away from long-lead time, hard to acquire sub-assemblies.

Taylor Howard, approaching the same problem nearly 18 months after Andy, came to a similar conclusion. In Tay's case his new commercial version receiver would not have either of

SATELCO- High Quality Private Terminals

SPECIALISTS IN OVERSEAS systems for domestic and Intelsat television reception, fast processing of export orders and design and systems for 'difficult' reception areas. Antennas from 10 to 20 feet available.

PLUS - currently closing out inventory on a popular brand 10 foot TVRO parabolic (and some associated electronics); **we can save you real money** whether foreign or domestic buyer!

SATELCO- 5540 West Pico Blvd.
Los Angeles, CA 90019
[213] 931-6274

EAGLE

SPHERICAL SECTION ANTENNAS

10, 12, 16 Feet

To be introduced at SPTS '80 Calif.

Moderately Priced

Wagner Industries
Box 559, Alva, Ok. 73717
(405) 327-1877

SELECT YOUR CATV SYSTEM

Satellite Programming
INTELLIGENTLY...

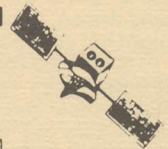
...with **SAT-Guide**

Twenty channels of programming today on FI, soon 35 on FI and D2. Keeping up with what is 'up', when, is almost impossible. Until SAT-Guide.

ALL FI programs on all transponders are listed in this unique programming guide to satellites. **INCLUDES** daily program listings **PLUS** monthly summaries of movies, sports and specials. Only \$28 per year from:

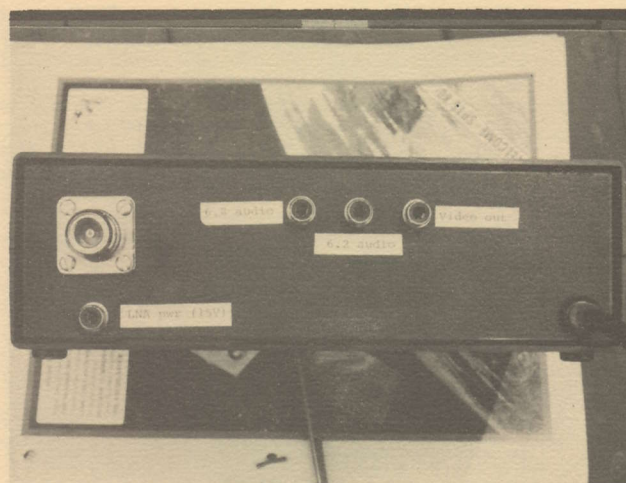
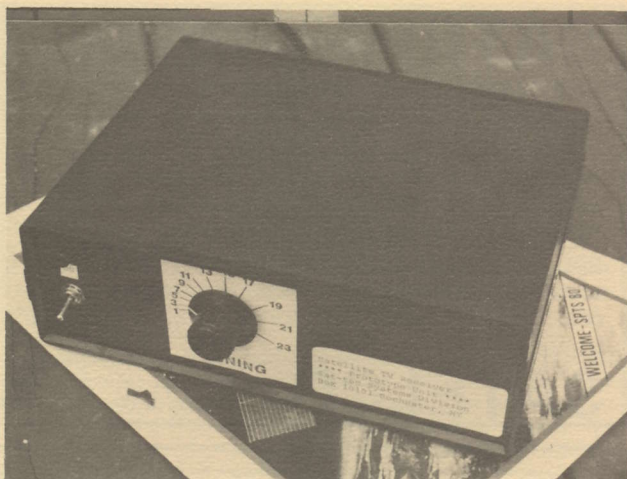
SAT-Guide
Division of Commtek

P. O. Box 1569
Hailey, ID 83333



the two hard-to-get long-lead-time sub-assemblies that were hanging up so many others. Tay designed his own doubly balanced mixer (whereas many are using the VARI-L DBM-500) and then after he discovered that AVANTEK could apparently not deliver to him and his cohorts 10,000 8360 VTO local oscillators over a period of a year, he set out to design a replacement local oscillator.

What does all of this have to do with the SAT-TEC receiver? Well SAT-TEC took the **third** approach; they carefully looked at every single part in the typical satellite receiver, identified the same two parts that have been hanging everyone else up as well, and then by using a combination of clever engineering (designing around parts that had no



business being there in the first place) and clever parts sourcing (the art of locating parts when nobody else can) they designed the SAT-TEC receiver shown here.

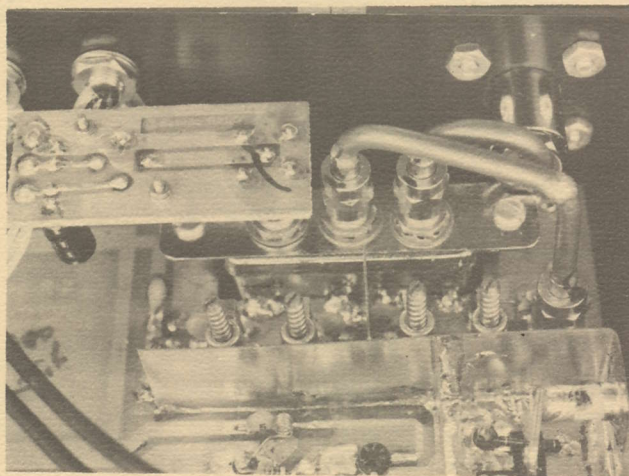
The receiver measures 8 inches wide by 6.25 inches deep and 2.5 inches tall. It weighs 2.5 pounds (!) and fits into a slim-line briefcase. Operational features are as follow:

- 1) **Channels** - tunes all 24 channels with some apparent outside of band overlap on both ends (perhaps 30-50 MHz).
- 2) **Outputs** - One baseband video (ready to drive a monitor or an RF modulator with 1 volt peak to peak video), two audio subcarriers (one for 6.2 and one for 6.8 MHz although they could be tuned by you or at the factory for subcarriers in the 5 to 7.5 MHz region).
- 3) **Accessory jack** - a 15 volt DC powering jack to plug in your LNA.
- 4) **Operational controls** - One on-off switch and one channel tuning knob.

The unit you see here was a prototype; it differs from the production models only in that the front panel channel tuning dial is hand drawn and the lettering is either typed on a label or hand drawn. Other than that, our unit is just like a unit that you might get your hands on.

SAT-TEC resolved the VARI-L (DBM-500) mixer problem by entering an order for one heck of a bunch of the devices. In short, they got the supplier's attention. Where smaller purchasers are having difficulty getting their smaller order filled, SAT-TEC is having no problems.

The microwave region (3 GHz range) high local oscillator is not an AVANTEK 8360 like many other receiver manufacturers have attempted to use; rather it is a Watkins-Johnson (WJ) V802 LO source (tunes 2.5 to 3.7 GHz). There are several advantages to the WJ unit, if you are SAT-TEC:



- 1) It has a lower set of FM sideband noise figures than the published spec on the AVANTEK 8360 (FM sideband noise is unwanted noise that comes out of the oscillator and can in severe cases degrade the performance of the receiver noise figure);

- 2) With everyone else in the field apparently buying or **trying to buy** from AVANTEK, by dealing with WJ SAT-TEC has been able to get a pretty decent supply of the hard to source high LO.

We don't like to dwell on the mis-fortunes of locating parts for volumes of (relatively) low-cost home receivers but if you are a dealer or distributor (or would-be either) you had better understand going in that tying your fortunes to a receiver that can't be semi-mass-produced with regularity is not in your best business interest. A receiver supplier that seems to have his own supply lines well in hand is going to be a supplier that you can live with, happily, much-much longer!

NOW - how well does the SAT-TEC receiver work?

The receiver arrived at CSD just as we were putting the finishing touches on our initial MOLNIYA reception project. We already had a super-deluxe threshold-extension CATV/ broadcast professional receiver on the outdoor table to use for our MOLNIYA search and since we were going to do a preliminary system check out with the 11 foot antenna sweeping across the US/Canada satellite belt it seemed like a good point to do some quick checks on the SAT-TEC as well. Here are our observations:

- 1) In spite of the much touted threshold extension feature on our high dollar comparison radio, the SAT-TEC had every bit as much receiver sensitivity as the brand 'M' radio. By pulling the 11 foot antenna off the satellite by 1 to 1.5 degrees and thereby reducing the satellite signal to the receivers by a considerable amount, we could not tell **which** radio first held sync and first passed color; it was a dead-heat. **Audio recovery** on the the \$7000 radio was a tad better, especially under extremely weak signal conditions, but the difference was far from dramatic.
- 2) On very strong signals and saturated colors (such as you find with color bar transmissions or quick transitions from bright red to a lighter color) the \$7000 receiver had a picture-sharpness edge. Probably not \$6,000 worth however!

The SAT-TEC receiver, like so many now available in the private TVRO field, uses the tried and true phase lock loop (PLL) demodulator; the NE 564. As CSD has discussed several times in recent months, there are things about the 564 PLL which make it less than a totally perfect demodulator tool for video. Most of all, it has difficulty accepting the full FM sideband energy present up to the point where 99% of the power contained in the FM video carrier is found. The PLL doesn't just naturally like to 'track' up into the 8/9/10 MHz deviation region and when a saturated color appears on the screen it is in the upper frequency portion of the demodulated waveform that much of such energy appears.

Prodelin's New Segmented Earth Station Antennas

The first antenna to put it all together.

Never before has anyone combined all these features in one antenna:



ALL PARTS 100% INTERCHANGEABLE
Interchangeable segments automatically self align. No special tools needed to erect.

REDUCED WEIGHT
10 foot dish weighs only 140 lbs. Shipping volume under 60 cubic feet. Means big savings on shipping costs.

HIGH GAIN
40 dBi

CAN BE HAND CARRIED UP TO A ROOF!

For example the ten footer's 8 petals weigh under 15 lbs. each. No cranes needed. Send the antennas up by elevator or the stairs!

A NEW GENERATION OF SEGMENTED, LIGHTWEIGHT, FIBERGLASS ANTENNAS.
Tough, resilient, "forgives" rough handling. Available in sizes from 4 foot to 5 meters.

AVAILABLE RIGHT NOW IN MAJOR QUANTITIES.

100 units-per-day capacity, plus East and West coast warehouses, assures rapid delivery.

PROVEN SURVIVEABILITY

Materials tested and approved in accordance with MIL STD 810 B. Handles the roughest weather, including hurricane force winds and beyond (up to 125 MPH)! U/L approved fire retardant.

OTHER MAJOR FEATURES

- Prodelin textured front surface diffuses solar heating.
- Unpressurized feed.
- Enclosed focal point LNA with polarization from the rear of the antenna.
- Plane and dual polarized antennas are available, all of which meet appropriate FCC requirements.
- Available in environmentally acceptable tones of green, white, tan.
- Self indexing flanges (Prodelin exclusive) eliminate guide pins, add to simplicity.
- Interchangeable fiberglass segments have their own inherent strength (unlike fragile aluminum segments).
- Antenna sheds ice so easily in most locations, it's considered virtually self-deicing. If ice does form it can be manually deiced with the rap of a mallet.
- Patent applied for.

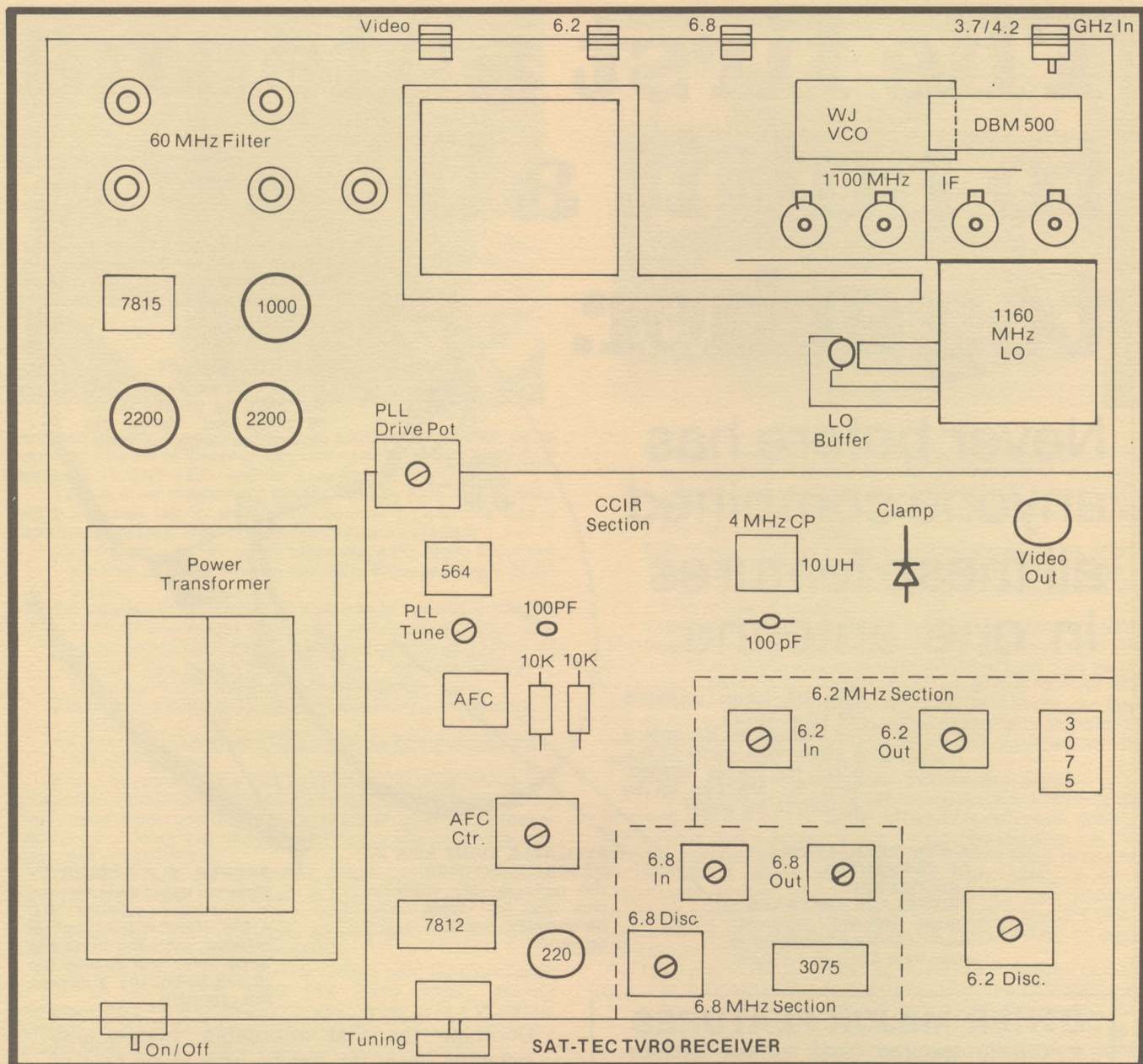
Combine the first affordable, high-quality reflector (from the people who know how to build them) with the low-profile, hour-angle mount (from the people who know how to secure them) for the most desirable TVRO antenna system available. We challenge you to find a higher performance/cost ratio anywhere.

Prodelin®

TRISTAR
GENERAL, INC.

4810 VAN EPPS ROAD
CLEVELAND, OHIO 44131

(216) 459-8535



On a PLL demod receiver you see this happening by noting that the saturated (bright red) colors seem to have poorly defined right hand edges; they may even 'tear' on you with the saturated colors 'bleeding' into the video to their right.

Some people maintain that careful (by hand) selection of the 564 devices plus some extra attention to baseband signal processing, filtering and amplification you can either improve or even cure this problem. When we see a 564 demodulator that has this problem **totally solved** under any and all conditions, **we'll be the first to tell you about it**. For now the 'problem' is present in varying degrees in virtually all 564 PLL receivers.

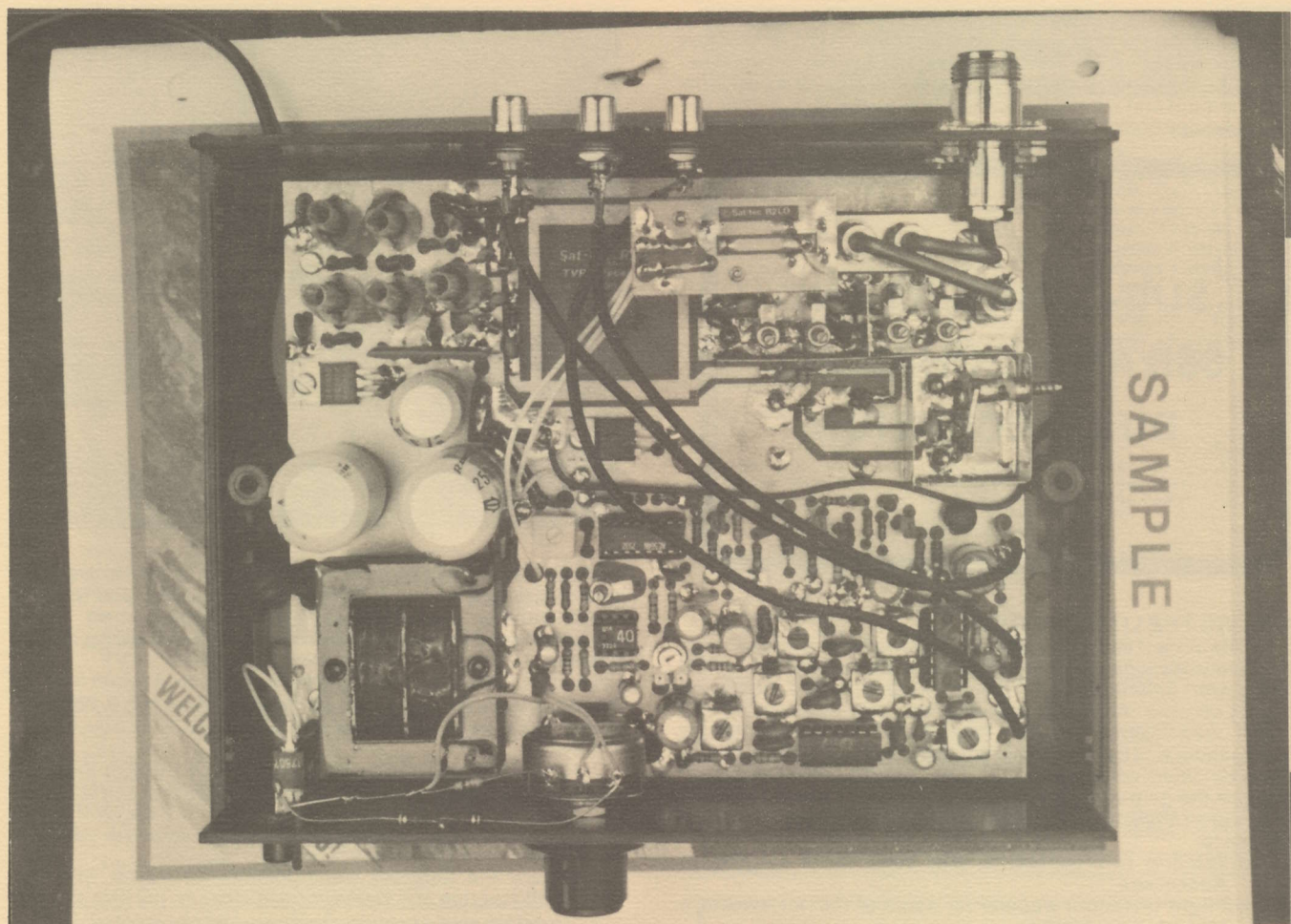
For the record, it is not a bad problem in the SAT-TEC; which means we've seen it much worse in others. Of course the trade off here, in using the 564 demod rather than the conventional discriminators (such as AVCOM uses) is some improvement in apparent system sensitivity. Evidence suggests that the 564 is a form of threshold extension all by itself and that performance on weak signals (as proven during the INTEL SAT tests conducted during SPTS '80 Miami on the

Brazil Rede Globo signal) is superior with a 564 or some other form of PLL demod.

Our critical eye found some of this PLL-bleeding with the SAT-TEC but several people who had never seen satellite TV before saw the pictures and said they were the best TV they had ever seen. Which only proves how spoiled one gets after living with high resolution 52 dB signal to noise satellite video for three years!

We ran the SAT-TEC, which is shown here in diagram form as well as photo form, for several weeks before writing this report. It worked **better** than the \$7000 radio on the strange-to-America Russian standards signals from MOLNIYA; we think the complex 30 Hz energy dispersal waveform eliminator in the high dollar receiver didn't like the Russian Pulse Width Modulation audio signals which the SAT-TEC receiver largely ignored. We have the following operational observations:

- 1) The receiver sat outside in the sunshine for several straight days while we played with MOLNIYA. The black plastic case soaked up the sun's rays (it was 90 in



the shade most of those days) and we worried about the unit getting too hot and either frying or getting unstable. **Neither happened.** There are probably more severe heat tests than leaving it in the bright sunshine all day, running, but we can't think of any a normal receiver is likely to encounter. We would like to see some ventilation however; it would just make us feel better. (The receiver in the sunlight understandably ran 'hot to touch', especially over the power transformer.)

- 2] There was some amount of tuning dial calibration drift over the course of the day when the unit was outside and getting hot. As it warmed up, the dial calibration drifted upward. Very slowly however and we don't classify this as a problem, only an observation.
- 3] The tuning, unlike some PLL demods we have worked with, is very smooth. There is no **one-critical-point** where the sparklies go from black to gone to white; it tunes smoothly from black to a broad no-sparklie to the white area. That's good.
- 4] If you want to tune in terrestrial (typically 4 MHz deviated) microwave video with the SAT-TEC receiver you'll have to ask the factory to tell you how to switch the the demodulator polarity. It involves cutting a trace on the board and either installing an extra switch or jumper. Remember, you are not supposed to be watching terrestrial microwave signals (we stumbled across some while looking for MOLNIYA and were momentarily puzzled why we could not resolve their video).
- 5] The receiver is rock (like in crystal controlled) stable. The AFC really works very-very well. We left it sitting on the MOLNIYA 3875 MHz center frequency for hours and hours with a T connector on the video output; one side of the T driving the video monitor and the other side

driving a Kenwood R-1000 communications receiver. With the Kenwood we were tuning in MOLNIYA SSB and unmodulated carriers and for hours on end the SSB carriers stayed right where they were supposed to be. You can 'feel' the AFC grab ahold and lock in as you tune in a signal and it is a feeling of confidence to know that it is working well.

- 6] Although the video output is low-pass filtered to remove the audio sub-carriers above 4.2 MHz we found we had no difficulty going out of the video output into a Rohner sub-carrier detector tuned to the MOLNIYA 7.5 MHz FM signal. If we could do this all the way up at 7.5 MHz the lower sub-carriers would obviously present no problems.

- 7] The plastic case bothered us at first. We still remember the experience in Miami where the proto-type Washburn receiver with a plastic case had gobs of RF bleed-through problems from the local channel 4 TV station. **We also have a local channel 4**, barely 15 miles distant and line of sight to our outdoor work table where we ran the receiver during the MOLNIYA tests. **We had no signs of the local channel 4 at all.** Not a bit. We can't say that you could march up to the local channel 4 TV transmitter and hook up the SAT-TEC receiver and make it play without off-the-air bleed through, but in our case we found none.

We found the 6.2 and 6.8 MHz sub-carriers built into the SAT-TEC receiver right on the money; you could switch from SATCOM (6.8 typically) to WESTAR (often 6.2) and the audio was there at the appropriate spigot.

SAT-TEC (P. O. Box 10101, Rochester, N.Y. 14610; 716/381-7265) has a good product here at a good price. There's room in the pricing schedule for any legitimate dealer (i.e.

somebody who plans to buy say 25 or more per year) to make money carrying these receivers and the \$995 user price makes it the lowest priced full TVRO receiver in the field at this time. The firm is not stopping here; a deluxe TVRO receiver is in development and we will be anxious to see what it does that the \$995 package does not do.

SUB-CARRIERS AND SSB AUDIO CHANNEL BIRD RECEPTION

FINDING THE LITTLE FELLERS

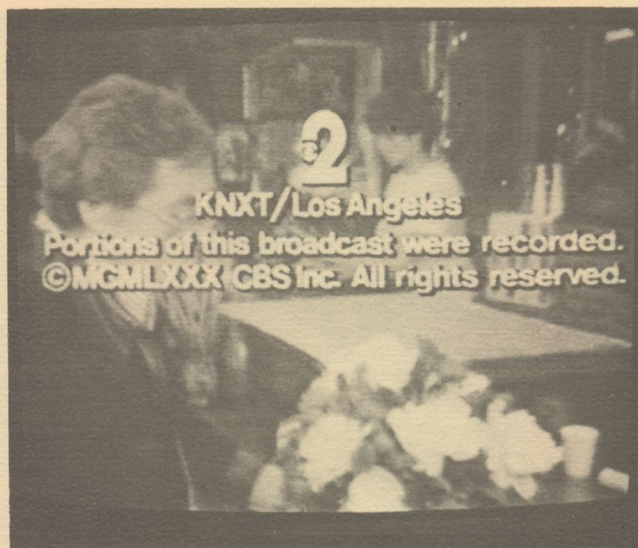
The June (1980) issue of **CSD** explained that if you connect a communications receiver (capable of upper sideband/USB and lower sideband/LSB) antenna input to the baseband output on your TVRO (video) receiver, you in effect have a brand new 'spectrum' to tune each time you change transponders. That each transponder **not carrying video** is typically filled with precisely 4 kHz spaced "radio signals" that run the gamut from one side of (private) Telco voice links to a wide range of informational services including but not limited to:

- a) Satellite re-broadcast of **AM** band radio stations in **Anchorage**
- b) **Flight** (aviation) **weather** for much of the northwestern US including Alaska
- c) (Private) television **network** 'communication lines' between network headquarters and field crews working on remote (video) pickups
- d) National **Radio network feeds** for all major radio networks including National Public Radio (NPR)
- e) A wide variety of **public assistance radio links** for Alaska including medical services, fish and game services, Alaskan legislature advisories
- f) **News 'wire' services** from UP, AP, Reuters and others
- g) Financial and commodity **reports** on both voice and teletype

The capacity of the present satellites to provide interference-free narrow band (audio or data) services spaced 4 kHz apart numbers in the millions of channels! One way to view all of this is to consider that each frequency modulated transponder (there are presently nearly 200 such transponders in North American domestic operation) is technically capable of in excess of 2,000 such voice-grade channels. In effect, there **could be** more than 2,000 4 kHz spaced voice grade channels on a single transponder if the first carrier was located at 4 kHz (0.004 MHz) and the last carrier was located in the 8,000 kHz (8.00 MHz) region. Each transponder then is a mini-frequency-spectrum to itself, capable of duplicating the entire radio spectrum from 0 MHz (DC) to 8 MHz.

Of course not all transponders are so configured (if they were we'd have no television!) since narrow band services and video cannot share the same transponder except when the video services occupy something less than a full transponder (such as with the Alaskan 1/2 channel format video seen on transponder 23 of F2). It happens that on common-to-TV buffs satellite F1 we have two transponders 'dedicated to narrow band' (transponders 15 and 19). Other satellites however are far more heavily loaded with narrow band services.

Tuning in these services is duck soup if you have access to



TRANSPONDER 23 on F2 is utilized early in day to transmit stateside programming to Anchorage where it is taped for later re-transmission to Alaskan Bush Terminals on same transponder. Here Los Angeles KNXT [news] is being sent to Alaska.

a suitable LSB/USB communications receiver. Around 85% of the services to be found will be tuneable on such a receiver operating in the **lower** sideband (LSB) mode after you do the following:

- 1] Switch your TVRO receiver to a transponder that has such services (i.e. 15 on F1 is a good place to start);
 - 2] Run a piece of coaxial line from the baseband-video output on your TVRO receiver to the antenna input on your communications receiver;
 - 3] Place the tuneable communications receiver into the LSB position and start tuning as close to 100 kHz as your receiver will function, tuning upwards (higher in frequency).
- NOTE: Many communication receivers have 500 kHz as their lowest tuning range and they work upward from there to approximately 30 MHz. The Kenwood R-1000 receiver, a relatively new solid state unit, tunes down to 0 MHz (0 to .2 with some reduced performance) and up to 30 MHz.**

- 4] As you tune 'up the band' you will hear a brand new 'carrier' in 4 kHz steps; not solid across the spectrum but nearly so. Depending upon the time of day and the transponder, between 10 and 50% of these carriers will have voice or other data on them.
- 5] If as you tune you cannot 'resolve' the voice or data clearly, try switching to USB (upper sideband); as noted in the June report some Groups and Supergroups (or frequency blocks) of the spectrum may be transmitted 'inverted' so that the sideband use is reversed from lower to upper.

6] And, depending upon the transponder selected and the time of day, you will continue to find 'carriers' in 4 kHz steps all the way up to as much as 8,500 kHz (8.5 MHz) on the busier transponders although many are 'loaded' only up to the 4 MHz or so region.

While the news 'wire' (radio teletype) services require additional processing with an RTTY 'demodulator' and interfacing to some type of 'printer' that will display either a CRT copy or hard (paper) copy of the RTTY transmitted information, most of the 'services' to be found will be fully and finally demodulated as they come through the speaker on your communications receiver.

With that basic explanation, here are some of the things to look for:

- 1] **Transponder 15 / F1:** This transponder is one of the most heavily loaded in the sky these days **although** most of

what is here is of a purely 'private' nature. The first audible carrier will be around 92 kHz while the last audible carrier will be near 8433 kHz. LSB predominates although carriers between 313 and 481 kHz are USB. A major hotel chain has one side of their 800 number service in the 1634 (1638, etc.) to 1690 kHz portion. More hotel reservation lines in the 2182-2194 kHz region. Stock market reports are found on 1622 kHz. Uplinking from the Chicago area is found in the 6293 (USB) upwards region.

This is a good transponder to 'practice' on or get the hang of what this is all about, but there is (as noted) very little of a public nature here and the telephone conversations (of which there are hundreds of channels) are protected by the Privacy of Communications portion of the Communications Act.

2) **Transponder 7 / F2:** The RCA SATCOM II satellite has many more transponder dedicated to narrow band services and its 119 degree (west) location makes it an easy target for all of the USA and Canada. The first carrier on this transponder will be 102 kHz while the last or top carrier will be around 3282 kHz. Among the more interesting things to be found are:

- a) 294 kHz (LSB) - **Alaskan Forces Satellite Radio Net**
- b) 333 kHz (USB) - Anchorage radio station KBYR
- c) 393 kHz (US) - **Anchorage radio station KYAK**
- d) 958 kHz (LSB) - 'Soul' Radio Network
- e) 1190 kHz - **Alaskan Forces Satellite Radio Network**
- f) 1946 kHz - Kenai Flight Service Weather (at 15 minutes past the hour) for all of Alaska
- g) 3246 kHz - **Intercom line between remote Alaskan TVRO/ARO sites (combo up and down links) and network control in Anchorage.**

3) **Transponder 11 / F2:** The first carrier on this transponder will be 102 kHz while the last or 'top' carrier will be 3346 kHz. Included are:

- a) 134 kHz (LSB) - **National Public Radio service**
- b) 214 kHz (LSB) - **Alaskan Forces Satellite Radio Network**
- c) 230 kHz (LSB) - **Alaskan fisheries communications channel**
- d) 598 kHz (LSB) - radio network feed
- e) 602 kHz (LSB) - **National Public Radio service**
- f) 814 kHz (LSB) - **National Public Radio service**
- g) 946 kHz (LSB) - **RCA Alaskom internal maintenance communications channel**
- h) 1182 kHz - **Alaskan Forces Satellite Radio Network**
- i) 1234 kHz - **Anchorage flight center communications**
- j) 1498 kHz - Anchorage to Fairbanks 'enroute' communications (aircraft)
- k) 1502 kHz - **Alaskan Forces Satellite Radio Network**
- l) 1562 kHz - **Alaskan Forces Satellite Radio Network**
- m) 2366 kHz - **Valdez [Alaskan] Weather Advisory service for all of Alaska**
- n) 2522 kHz - Anchorage radio station KBYR
- o) 2686 kHz - **Alaskan Bush Service medical assistance channel**
- p) 2754 kHz - **Alaskan Forces Satellite Radio Network**
- q) 2802 kHz - **Christian Radio Network**
- r) 2854 kHz - Anchorage radio station KFQD

If you are interested in finding some of the (mainland US) national radio service feeds, here is a partial listing of where such services have been observed operating.

Transponder 16 of SATCOM FII: CBS Radio Network News feeds on 238 kHz (LSB); service goes to unmodulated carrier between news feeds. Philadelphia radio station KYW is found on 552 kHz (LSB). UPI Audio News for radio stations is found on 682 kHz (LSB) but reverts to unmodulated carrier between feeds. AP Radio Network is found on 700 kHz (LSB), reverting to unmodulated carrier when there are no feeds. NBC Sports for radio stations is found on 694 kHz.

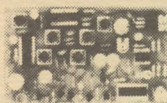
Transponder 10 of SATCOM FII: AP Radio Washington is found on 950 kHz (LSB). Mutual Radio News is found on 2082 kHz (LSB).

Transponder 4 of SATCOM FII: CBS Radio Network sports feeds are found on 421 kHz (USB). NBC Radio Net-



NEED PARTS...

Sat-tec's Got 'em!



SPECIFICATIONS:

Signal input: 70 MHz at -20dbm (22mv)
AFC lock range: greater than 5 MHz
Sound subcarriers: 6.2 MHz and 6.8 MHz fully independent
Video level out: std. 1 volt p-p
Audio level out: 1 volt p-p
Power requirements: 15VDC @ 200 ma
Demodulator: NE564 PLL IC
Tuning voltage out: 2 to 13.5 volts
Tuning voltage in: 0 to 15 volts max.

70 MHz DEMODULATOR CARD

The Sat-tec D-1 demodulator is the last block in a TVRO system, it is where the 70 MHz IF signal is converted to video and audio. The D-1 contains a PLL demodulator, video processor (CCIR de-emphasis, 4 MHz low pass filtering and 30 Hz clamp), dual sound sub-carrier demod and AFC circuitry. The power requirement is small, 15VDC @ 200ma., signal input is -20dbm @ 70 MHz. AFC will enable the user to lock most any VTO L.O. with no problem whatsoever. Video and audio outputs are a standard 1 volt p-p suitable for driving any monitor, VTR, or modulator.

D-1 Demodulator Kit		\$99.95
D-1 Demodulator PC board only		\$49.95
Part Number	Description	Price Each
Avantek GPD-1002	1GHz, 12 db gain TO-8 can amplifier, 15VDC	\$45.00
Watkins-Johnson V802	2.5-3.7GHz VTO, lower noise than Avantek types	120.00
Watkins-Johnson V705	600-1000MHz VTO, lower noise than Avantek	120.00
Signetics NE564	PLL selected to operate at 70MHz	7.50
Var-L DBM-500	4GHz mixer, SMA connectors	85.00
Ampexer ATF-417	1GHz, 25 db gain hybrid amplifier, 20-24VDC	19.00
Motorola MWA-110	400MHz, 14 db gain, -2.5 dbm	9.00
Motorola MWA-120	400MHz, 14 db gain, +8 dbm	9.75
Motorola MWA-220	600MHz, 10 db gain, +10.5 dbm	12.40
Motorola MWA-230	600MHz, 10 db gain, +18.5 dbm	13.50
Motorola MWA-310	1GHz, 8 db gain, +3.5 dbm	12.40
Motorola MWA-320	1GHz, 8 db gain, +11.5 dbm	13.50
Motorola BFR-90	3GHz F ₁ NPN transistor, 15 db gain @ 1.2GHz	2.50
Motorola MRF-901	3GHz F ₁ NPN like BFR-90 but 2 emitter leads	2.75
Regulators: 7800 Series	5V, 8V, 12V, 15V, 1A TO-220	1.50
Regulators: 7900 Series	-5V, -8V, -12V, -15V, 1A TO-220	1.75
IF Transformer	10.7MHz IF can be padded to 6.2 or 6.8MHz	1.25
Tuning capacitor	10pf multi-turn for filters, PLL, etc.	.95
Coil form + can set	Nice coil form set for filters, good to 120MHz	2.00



Sat-tec Systems; Box 10101
Rochester, NY 14610; (716)381-7265



TERMS: Add 5% shipping and handling charge. Payment in full required. Minimum order \$50.00. Cash orders only.

3.7-4.2 GHz SUPERVERTER

70 MHz IF, 40 MHz bandwidth with 25 dB gain. 10 dB noise figure, 10 dB (minimum) image rejection. Can mount at antenna with SMA input, 'F' output connectors.

Wired and tested, less power supply,..... \$300.

IF Amp (70 MHz center) with 45 dB gain, 30 MHz bandwidth..... \$ 80.

TVRO DEMOD (discriminator type) baseband output..... \$100.

Terms: Payment with order, delivery 2-6 wks.

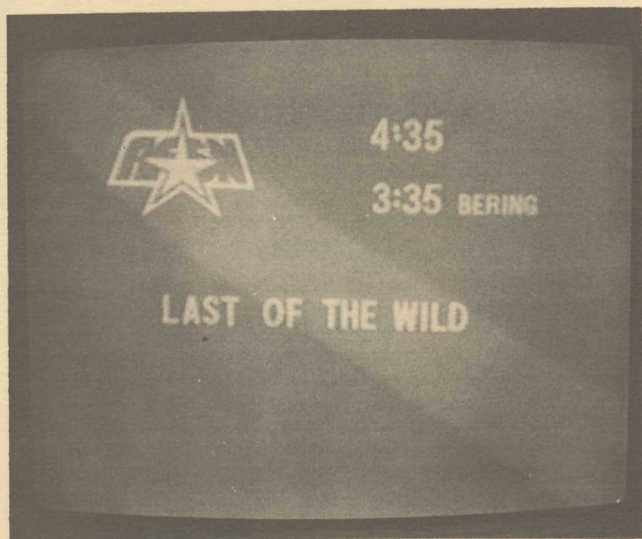
GHZ ENGINEERING

P.O. Box 33205 Phoenix, AZ 85067 (602/266-9749)

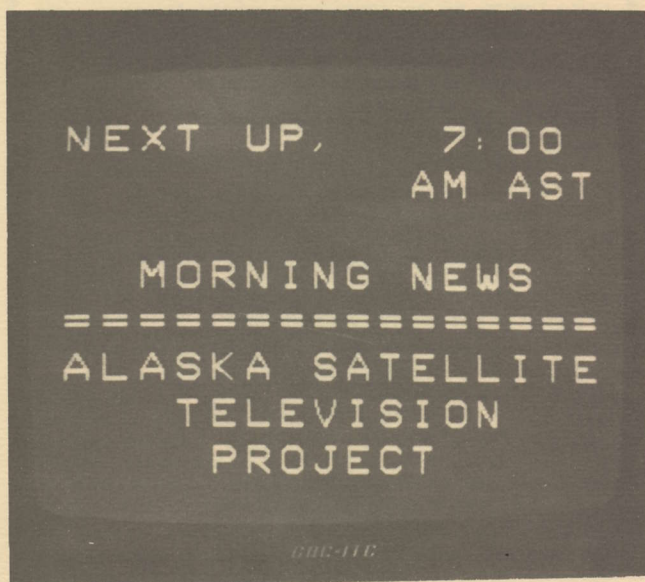
work sports feeds are found on 469 kHz (USB). Additional sports feeds from UPI are found on 481 kHz (USB).

While you are researching SATCOM FII at 119 degrees you also might find the video programming of interest. Transponder 8 is leased by NBC for intra-network linking, primarily for west coast feeds to the east coast. Program segments (i.e. the **Prime Time Saturday** program segments from Jack Perkins) originating on the west coast are sent to New York here. Normally color bars are up on transponder 8 when there is no video being fed. Remote (west coast) sporting events, sent to New York for plugging into the terrestrial circuit, are often found here on weekends. If you have two satellite receivers to work with, you can often find a special audio circuit on transponder 20, **7381 kHz**, USB on which the remote field producers communicate with network control in New York about the progress of the remote feed.

Transponders 9 and 23 are largely dedicated to Alaskan video. The transponder 9 feed is of particular interest since it is the 'Alaskan Forces Satellite Network' service that begins feeding tape delayed programming from the mainland US to Alaska around noon central time and continues running (because of the 5 hour time difference between the east coast US and central Alaska) until well into the wee hours of the morning. This 'network' borrows freely from the 'best' of CBS, ABC and NBC along with some syndicated programs making up a full broadcast day for service personnel scattered throughout Alaska. Note the twin-time listings on the promotional slide for 'Last of The Wild'; viewers in the Bering Straights area are six hours removed from the east coast of the USA!



AFSN - Alaskan Forces Satellite Network operates around 16 hours per day on F2 transponder 9 feeding 'network' programs to military personnel scattered throughout Alaska [and elsewhere]. Time in upper right reflects AST and time zone for far-western Bering Straight area. Note programs do not always start on even hour or half-hour points!



ASTP - Alaskan Satellite Television Project uses transponder 23 to send delayed mainland programs and in-school instruction programs to some 60 + 4.5 meter Alaskan 'Bush Terminal' sites.

Transponder 23 is a special service channel for Alaska and it does double duty as a system of getting US live network programs to Anchorage during the early hours each day, and then after the programs have been received in Anchorage and taped for later replay, the channel is reconfigured as a broadcast channel and programs are sent **back out** to the so-called 'Bush Terminals'. This service is, unlike the AFSN the 'Alaska Satellite Television Project'. Some 60+ receiving sites scattered throughout Alaska are interconnected via satellite and they rebroadcast the satellite fed programming through local low-power VHF television stations (actually 'translators').

If you live in the eastern and central time zone, the primary benefit of transponder 23's Alaskan Satellite Television Project is that popular network shows such as the CBS Morning News or Good Morning America are sent from Los Angeles north to Alaska while they are running in the Pacific time zone (i.e. after they have left the air in the east and central zones) so you get an extra shot at the morning news, often while it is almost noon in the east. Then a few hours later you get a third shot at the same programs as they are rebroadcast back into Alaskan Bush Terminals. You can watch 'Good Morning America!' at 12 noon in the east if that fits your schedule. Don't be surprised if there is **no audio** on many of the transponder 23 transmissions however; it is often sent via a separate transponder as an audio-only carrier. Transponder 9 for AFSN however has the standard 6.8 MHz audio sub-carrier.

SMALL SYSTEM APPLICATIONS

LOVE THE CANADIAN SPIRIT!

In the ongoing battle of words (and not much action to date), the latest action of a segment of British Columbia provincial government has Canada buzzing.

An (illegal) satellite TV receive dish has been installed atop the BC provincial legislature building. The antenna plus electronics will be used to feed reception of **American** satellite programming to various offices in the building. Dr. Pat McGeer, BC Minister of Communications, says the dish is his province's official reaction to the latest warnings from Dr. John Meisel, chairman of the Canadian Radio-Television Commission (CRTC) that he CRTC now intends to "...**prosecute persons operating illegal earth stations where the evidence and circumstances warrant...**".

McGeer estimates, through BC government sources, that there are no fewer than 200 (illegal) terminals now operating in British Columbia alone. The BC government is, in effect, challenging the federal Canadian government to a show down and shoot out; to see which side can prevail. The BC folks believe that as long as private individuals in Canada have the dishes plus terminals and they are **not** re-selling the signals to others, they are within the law.

Dr. Meisel and the federal CRTC is caught in a cross-fire. Cable television firms, US program suppliers (such as HBO) and the officials of Telesat (the Canadian satellite operator) are demanding that the federal Canadian government shut down the terminals. During the Canadian Cable Television Association trade show in Vancouver late in May there were

open appeals that the illegal terminals be shut down.

McGeer replied that "...television signals are essentially radio signals at a much higher frequency. Ottawa does not license radios or tell Canadians what stations they can tune in so it's utterly preposterous to treat television differently".

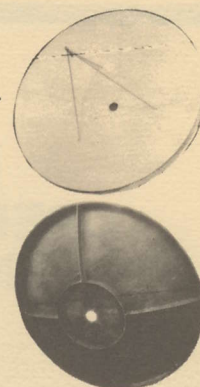
McGeer envisions immediate and hostile reaction from remote Canadians who are faced with loss of their only television service. "Search and seizure could create a bloodbath" commented an Canadian official "and the first time there is a real incident with somebody getting hurt, the publicity for the government would be almost unbearable".

During the Canadian Cable show an attorney for HBO said his firm was attempting to get the CRTC to act "primarily in those situations where remote Canadian cable operators are receiving HBO service and then re-selling it to whole communities. We are not authorized to sell our programs to Canada, by our program supplier contracts, and our SATCOM satellite is not authorized to serve Canada".

Now available at an affordable price...

PARABOLIC REFLECTOR ANTENNA

Big 10 ft. diameter fiberglass construction with 4 petals and center section. Bolts together easily in 45 minutes. Focal length 48.6, F/D Ratio .4, Gain 39db. Weight 185 lbs. Reflector only \$680.00. In lots of 10 \$585.00.



MINI - CASAT

2207 FORREST ST. TUPELO, MS 38801
601 862-2132 842-8617

GOOD NEWS FOR

Bob Cooper has prepared a custom sales demonstration videotape for you! Running approximately 11 minutes, 'The Satellite TV Story' captures the excitement and spirit of having satellite TV in your home. Perfect for one-on-one pre-selling, groups, un-attended displays. Color of course, prepared by Coop so that viewers grasp the essentials of a home terminal and how it works. AND - on the same (VHS or BETA) tape is approximately 50 minutes of 'informal Coop' directed to installers and dealers filled with system installation pitfalls and solutions. Excellent for training your people!

This custom videotape is available on BETA or VHS. The price is \$60 per copy **but** for an extra \$10 we'll 'tag' it with your company name, address and telephone number. Shipment within seven days of receipt of order. If you order the 'tagged' version be sure to specify what the tag is to say, and tell us whether VHS or BETA. **Order STP-1.**

PLUS - The world-famous 'Satellite TV Handbook' (more than 15,000 in print now) which has introduced tens of thousands to home satellite TV (at \$7.50 each) is now available in **50-Handbook-Bundles** for \$125 (postage paid within US, Canada). The perfect introductory piece to satellite TV and each copy carries the full \$7.50 list price. Sorry - only available in bundles of 50. **Order SEP-1 at \$125.**

SAVE EXTRA MONEY by ordering 'Combo-Package' including a 50 bundle of Handbooks **plus** STP-1 videotape. Price is \$175 US and Canada or \$185 with custom tag on videotape. US funds only. **Order CP-1.**

TVRO DEALERS/ DISTRIBUTORS/ MANUFACTURERS!



STT

P. O. Box G, Arcadia, OK 73007 405/396-2574

BIRD OPERATIONAL NOTES

Fallout from late-May NCTA cable 'bash' in Dallas still being heard. Likely results: [1] Present cable-only status (or only-cable as you prefer) of RCA SATCOM FI (135 degrees) to be pushed by competition from COMSTAR D2 (which has 11 transponders set aside for Cable's "Second Network" and now WESTAR 3; [2] entry of CBS (television network) into area of cable programmer has cable people concerned and competitive networks buzzing, and, [3] fears of mushrooming DBS (Direct Broadcasting Satellites) at proposed 12 GHz band seems to have been toned down with recognition that DBS is already here at 4 GHz. RCA FI will continue to be 'the programming bird' for period through launch of SATCOM FI-1A (now scheduled fall of 1981) but in interim between 8 and 11 new cable programming services will show up on D2 (95 degrees) and perhaps as many as 5 on WESTAR III (91 degrees). Leading route to Westar 3 is Satellite Syndicated Systems (operator of SPN on TR 21, FI) which decided at NCTA show that it wanted no part of COMSTAR D2 service. CBS had previously announced it too would be there with cable network programming, perhaps as soon as early 1981.

With between 33 and 35 cable programming services scheduled for three separate birds, cable operators seem willing now to talk in positive way about second and even third dish. Private terminal suppliers, such as Vidiark with a spherical antenna that allows the feed rather than the surface to move to change birds, are delighted. However **this** problem with spherical reflectors; WESTAR 3 is at 91 degrees, SATCOM FI is at 135 degrees. Between the two is 44 degrees of space—some 4 to 14 more than existing spherical designs can focus on (limited as they are to 30-40 degree window). Other private terminal suppliers, such as Gene Martin's Satellite Television Systems believe move to multiple cable programming spread over 44 degrees of sky can only make motorized antenna systems more popular.

RF Modulators

Channel 3 or 4

\$69⁹⁵

Call Toll Free 1-800-624-0851

In WV Call 1-800-325-0761

Or Write

Radio Shack Dealer

P. O. Box 188
Petersburg, WV 26847

How and when all of this new programming will shape up and actually be available remains to be seen; best bets are between September 1 and January 1 an additional six to eight channels will join those already operating; the new ones split between WESTAR III and COMSTAR D2 at first.

FI's video-active transponder group stayed even during June even though Ted Turner's Cable News Network (CNN) made debut on schedule at 6 PM eastern June first (a CNN program schedule in August Programming section of CSD). Turner's new news service looks good on transponder 14 but Trinity's transponder 13 feed has apparently quit for good. Trinity has been subject to frequent transponder failure for several months; they had purchased 13 on a 'pre-emptible' basis meaning if their transponder quit RCA was under no contractual obligation to find them a new transponder. It did. They didn't. RCA hopes they may be able to fix it but it doesn't look good. Other transponder operators who know RCA **expects** to lose one transponder per year are feeling mixed blessing; it wasn't theirs...but...the next one could be.

COMSAT has formed a new corporate group to regroup their push for 12 GHz DBS System. They now envision 3 satellites with two national channels plus two regional channels; a total of 15 regions in North America. Newest target date (they had originally said 1983) is 1985.

BLAIRSAT (commercials-via-satellite distributor) will start utilizing TR 2 on WESTAR 3 October 1st between 6 and 10 AM eastern to transmit commercials to TV stations in 31 markets. SPN will start simultaneous feeding of SPN programming (TR 21, FI) on WESTAR TR 9 July 18 in preparation for fulltime use of WESTAR 3. CBS will be shooting programming to cable systems on TR 6 of WESTAR 3. SIN is also on WESTAR 3, CNN uses a WESTAR 3 transponder for 'inward bound transmissions' to Atlanta. ABC, Hughes TV network also frequent users of same bird.

New 'Las Vegas based' programming services for cable, 'Las Vegas Entertainment Network' and 'CineAmerica' plan September start on COMSTAR D2 and possibly simultaneously on WESTAR 3. Las Vegas portion will be oriented towards LV shows and events; CineAmerica is special cable network for folks over 50.

Meanwhile the controversial 'Premiere' pay cable (movie) program, (see CSD for June, page P9) has announced a January 1981 'launch' and they will be charging cable systems \$3.75 per month for 12 hour service which will be on both FI transponder 21 and either transponder 9 on COMSTAR D2 and/or some transponder on WESTAR 3.

PERHAPS—just perhaps the push to scramble **some** of the pay-cable program channels (such as HBO) may be going in opposite direction. Attitude at cable NCTA bash was surprisingly tolerant. Scientific Atlanta has new stance of arguing this is not a big enough deal to warrant investing in industry wide scrambling-descrambling system. SA's John Bacon said "We should not be held hostage by a relatively small group of hobbyists".

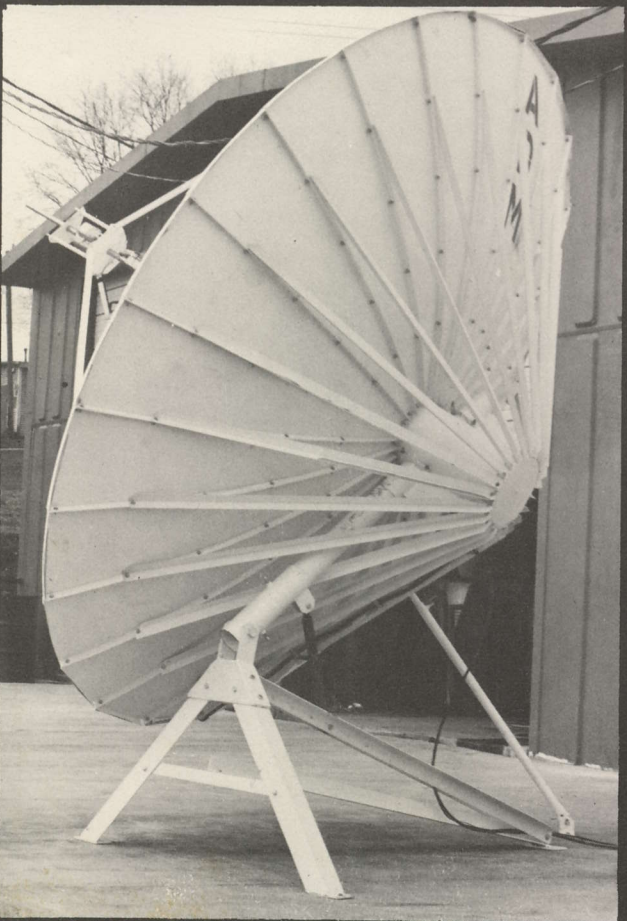
HBO's new 'maxi' service (now called CINEMAX), to be 24 hour 'action movie-movie oriented, now looks like a September start using transponders 20 and 23.

ESPN now firm on increasing daily broadcast schedule September 1st to 24 hours on transponder 7, FI. Service is already 24 hours on Friday-Saturday-Sunday.

Latest proposal for satellite distributed pay-programming comes from Carnegie Commission. PACE (Performing Arts, Culture and Entertainment) would offer around 200 hours per month including foreign films. No mention of satellite or time frame yet.

DOW JONES reports plus Merrill Lynch financial data will start test via COMSTAR D2 late this summer to cable system near Dallas. Data will be digital requiring special processing before display on CRT.

NOTICE to CSD subscribers: If you should be moving, we **MUST** have the **address label** from your envelope when you notify us of old and new address. If you are contemplating moving, stash the label that came on this month's magazine envelope away. Without it your address change request will be delayed substantially.



ANYWAY YOU LOOK AT IT...

ADM HAS YOUR ANTENNA!

AND YOUR TVRO SYSTEM. Rapid delivery on ADM's super-efficient 11 foot polar mount antenna (includes remote controlled polarization rotation system as well!), plus, packages are available for complete systems including LNA, 24 channel tuneable receiver and cabling. Why wait in a long line when you can get the best, today!

A SUPER TVRO ANTENNA SYSTEM. High quality panelized aluminum 11 foot dish and steel polar mount. Dish weighs approximately 200 pounds, mount 265 pounds. Precision designed, easy installation, zinc chromate base primed and heavy duty white top finish. The rotating feed is standard! Easily shipped and installed. Choice openings for dealers and distributors.



**Antenna
Development &
Manufacturing, Inc.**

P.O. Box 1178
Poplar Bluff, Mo. 63901
(1-314-785-5988)





Sat-tec

THE LEADER IN LOW COST TVRO

Introducing the R2 Satellite Receiver

A TV Satellite Receiver with all the features you need, at a price you can afford.

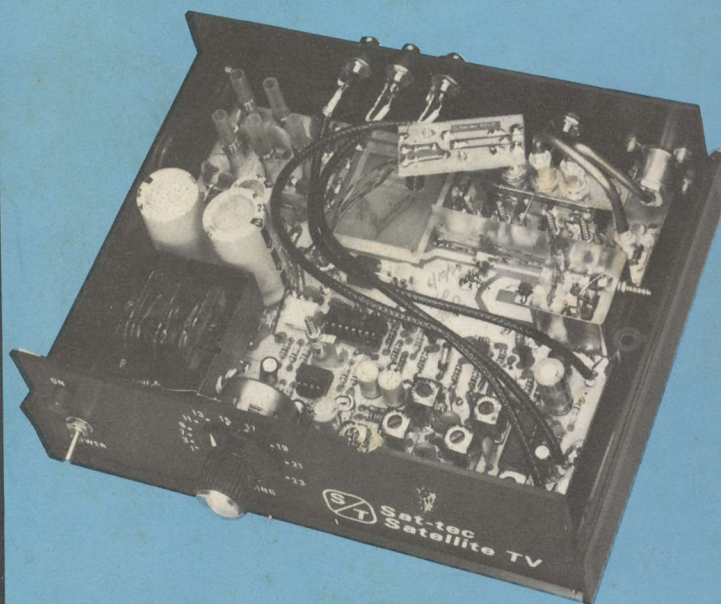


The Sat-tec R2 receiver is a versatile, consumer oriented unit designed for volume production. Easy operation and a clear, simple format makes the R2 idea for any application where non-technical users are involved. Fully frequency agile, the R2 may be used on 12 or 24 transponder birds, and since the tuning is continuous, foreign satellites such as Intelsat and Molniya can be received. A high performance AFC keeps the tuning accurate and sharp, fine tuning is not necessary. Standard one-volt P-P outputs for both audio subcarriers as well as video interface easily to any VTR or use the optional BC-1 modulator for direct TV set hook-up.

For a quality, low cost TVRO system, the Sat-tec R2 receiver can't be beat!

SPECIFICATIONS

- Frequency Range:** 3.5 - 4.5 GHz
Noise Figure: 12 dB, a 120° K 50 dB LNA and 10' dish provides good quality reception for most of USA.
Audio Subcarriers: 6.2 and 6.8 MHz standard, others available.
LNA Power: 15 volt at 150 Ma LNA Supply built-in.
Power Required: 110 VAC at 15 watts 50/60 Hz, 220 volt available.
Size: 8x6x3 inches, 3 lbs.
Price: \$995.00, completely wired and aligned; one year warranty.
Optional: BC-1 RF Modulator Kit, tuneable channels 3-6 with sound....\$24.95.



Sat-tec Systems

Penfield, NY 14526 • 2575 Baird Rd. • 716-381-7265